

PC MAGAZINE

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- After Hours: 6 Encyclopedias on Disk
- 11 Servers to Let You Share Printers
- More Jim Seymour Win 98 Survival Tips



FIRST LOOKS:

- Exclusive: 250MB Iomega Zip Drive
- 19" Flat-Screen Monitors
- Diamond Rio PMP300
- Deneba Canvas 6
- Sun's Solaris 7.0
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THE INDEPENDENT GUIDE TO PERSONAL COMPUTING VOL. 18 NO. 2 JANUARY 19, 1999

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Personal Multimedia

Remember when the promise of personal computers was just that—bringing computer power to individuals? People used PCs to create their own word processing documents and spreadsheets, things that automated processes done by hand or on large computers. Then, about ten years ago, we got desk-

top publishing applications and fonts and graphics in documents. Suddenly anyone could create professional-looking documents.

The same thing is happening now in multimedia applications, with software designed to let almost anyone create fancy graphics and even music. Such programs have been available for professionals for some time. Most of the publications and graphics you see are created in programs such as QuarkXPress, CorelDraw, or Adobe Photoshop or Illustrator. But for those of us who aren't graphics professionals, getting good-looking results from these programs is rather difficult.

On the other side of the spectrum, there are many template-driven and clip-art style programs that let you create graphics pretty easily but are aimed at home users.

Nowadays, many of us are creating our own Web sites and publications, and we want something unique but still professional looking. For those of us who aren't pros, this can be a challenge.

I recently met with a number of my colleagues to discuss some of the best software we've seen in the past year. The trend is clear: Many of the best programs are now trying to use the power of the PC to make it easier for anyone to create great multimedia elements.

This is particularly true in the graphics arena, where new applications aimed at typical business users—instead of graphics professionals—are the big trend. Among my favorites:

Microsoft PhotoDraw 2000 lets you start with your own photo or clip art and then format it for a document or a Web page. It offers basic photo-editing tools—for things like fixing red-eye—and lets you easily create compressed images that are the right size for putting on a Web site. It has a number of templates for logos and Web buttons, and was designed to fit in with the Microsoft Office suite.

Adobe ImageStyle is a bit more sophisticated

and is aimed specifically at people trying to create graphics for a Web site. You'd likely start with a photograph or clip-art image, but ImageStyle makes it very easy to create your own logos, graphics designs, and even Web buttons by applying predefined styles to your image. You can easily mix and match colors, textures, shading, and 3-D effects to create a unique image. And you can link graphics together, so that you can change them all at once, giving your site a consistent look. You can even attach things like specific HTML commands or roll-over text that pops up when you put your cursor on the graphic.

For those who want to get even more sophisticated, Macromedia Fireworks offers a vast array of higher-end tools packaged in a way that even those of us who aren't designers can use. Along with symbols and templates, it adds features such as bundled animations, color corrections, and image slicing (so users can download parts of an image first). It is designed as a complete environment for creating Web graphics, suitable for both business and professional users.

And it's not just graphics that are moving this way. If you want unique music for your Web page, check out

Acid, from Sonic Foundry. Acid lets you start with its music clips or your own files and then mix them together to create a unique sound. By combining various clips from multiple instruments, changing the tempo or the pitch, adjusting the volume, and adding a variety of effects, you can easily make your own music.

Taken together these programs represent a range of new tools that let anyone create pages that look and sound both unique and professional. With these tools, a digital camera, and a simple Web-site creation tool, you can easily create a top-notch site.

Letting average users create things only professionals could before is one of the PC's hallmarks. It's good to see it continuing. **PC**

Letting average users create things only professionals could before is one of the PC's hallmarks.



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BY GAIL SHAFFER

Downloading software. Besides sending e-mail, it's still our favorite thing to do online—especially if it's free or almost free! We scoured the Web and found a bunch of great programs for you that do all sorts of things. And we surveyed the best download sites so you can save some time the next time you're looking for something.....100



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BY STEVE RIGNEY

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BY SALLY WIENER GROTTA AND DANIEL GROTTA

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PERIPHERALS

Digital Cameras

BY DANIEL GROTTA AND SALLY WIENER GROTTA

They've come a long way (in a short time), baby. The latest generation of digital cameras delivers near-35-mm quality photos in larger sizes. Models range from \$300 to \$1,200 and vary in features, so we've awarded Editors' Choices in three market segments. For all that digital cameras offer, they're worth the price.....116



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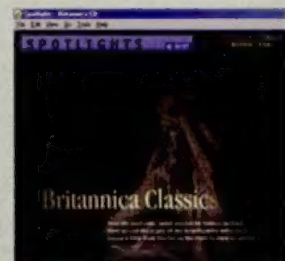
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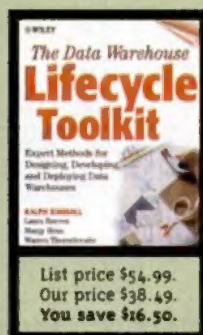
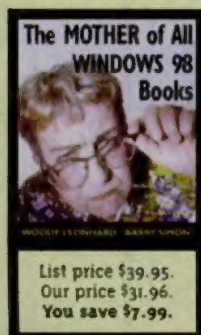
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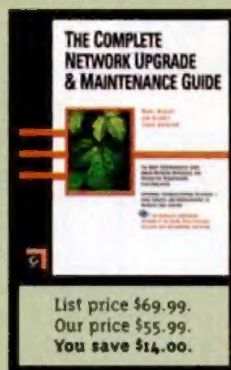
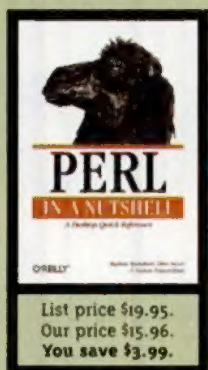
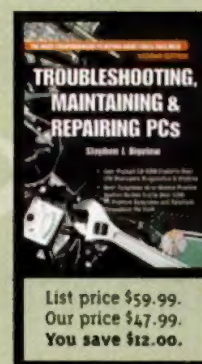
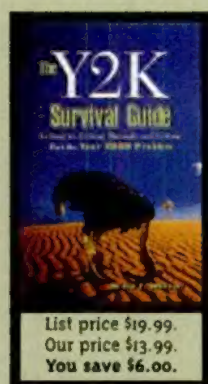
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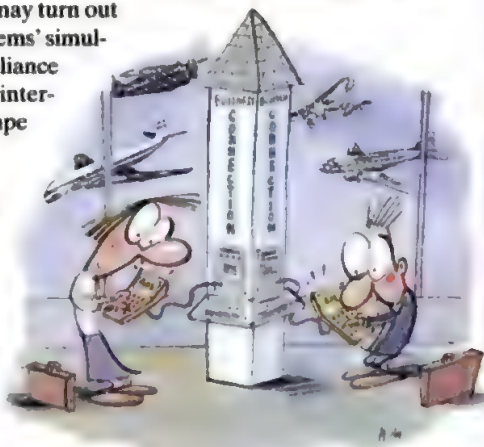
AOL Gazes at Sun

Now that AOL and Netscape have inked a deal for AOL to buy Netscape for \$4.2 billion, the far-reaching implications are becoming clear. It may turn out that Sun Microsystems' simultaneous strategic alliance with AOL is just as interesting as the Netscape side of the deal.

The AOL/Sun alliance is designed "to accelerate the growth of enterprise-class e-commerce, and to use Sun's Java technology to develop Internet devices that will help Internet users access America Online brands from anywhere, anytime," according to an AOL statement. As part of the deal, Sun will become a primary systems and service provider to AOL.

AOL will get more than \$350 million in licensing, marketing, and advertising fees from Sun. AOL's big hope, though, is that Sun's vision of ubiquitous networking—incorporating everything from Internet-connected soda machines to conference room tables with plug-and-play networking—can help make

AOL ubiquitous. Thus your Java-smart hand-held device might connect easily to an airport Internet kiosk, bringing up AOL and Netscape's browser.



AOL CEO Steve Case has made clear that he has his eyes on Sun's hardware and software platforms as opportunities to marry AOL with enterprise e-commerce strategies. AOL and Netscape will continue development of the upcoming Netscape browser, called Communicator 5.0, and will add Version 1.2 of Sun's Java Development Kit to the browser. AOL will also embed Sun's scaled-down version of Java, PersonalJava, in all AOL clients.

The PC Proliferates

Low PC prices and the lure of the Internet drove almost 4 million buyers to purchase their first PCs in the first six months of 1998, according to data from ZD Market Intelligence. Some 50 million homes—almost half of U.S. households—now have at least one PC.

Declining prices have also led more lower-income families to buy PCs. Households with incomes of less than \$30,000 accounted for a third of all new PC purchases in the first half of 1998. Still,

Household Income Is a Factor in PC Ownership

households flush with cash are far more likely to house PCs than low-income households: Those earning less than \$30,000 constituted only a quarter of all homes owning PCs.



Thinking Thin

of respondents to a recent PC Magazine Online poll told us that they didn't expect to have a flat-screen display on their desktops until 2001. Another 30 percent said that they'd have one by 2000. Only 13 percent of those responding said that they'd have one by 1998. Seven percent of respondents told us they already had flat-panel displays.

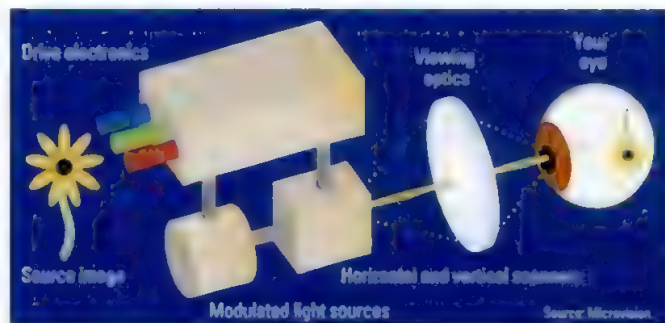
The Eye Is the Display

What's round, super-lightweight, ultraportable, low-cost, and long-lasting? It can support millions of colors at perfect resolution and comes in blue, green, or brown. It's your eye, of course, and it may be the ultimate display of the future.

Microvision, a developer based in Seattle, acquired rights to a technology known as Virtual Retinal Display (VRD) from the University of Washington Human Interface Technology Laboratory in 1993. A VRD device sends an encoded beam of light through the pupil to the retina, stimulating the receptors so you seem to see a high-quality image an arm's length away. It eliminates the need for any screen, letting the eye complete the function performed by a flat panel's matrix array.

Built into eyeglasses or goggles, VRD could display images that don't block one's view, useful in image-guided surgery. And in cellular phones and pagers, it could let you view e-mail, Web pages, faxes, and files as if on a full-size monitor.

Microvision says VRD poses no danger to the eye and adheres to safety standards.



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Walking Web

Wireless tablets for Web surfing on the run are due to arrive in 1999. The WebPad, from the Conceptual Products Group at Cyrix, is one of the most talked-about tablets. Powered by the Cyrix MediaGX processor, the tablet is about the size of an Etch A Sketch and accesses the Internet wire-



NO WIRES: The Cyrix WebPad.

lessly via a radio-frequency base station—a set-top box or standalone base station. The base station options provide for cable modem, ISDN, or 56-Kbps connections. Once you connect to the base station, you can roam wirelessly at a range of about 150 feet and use a pen and on-screen navigation buttons to surf the Web. Though the unit is only a prototype now, Cyrix is talking to manufacturers and expects units to start shipping early this year. Cyrix foresees the WebPad being popular for use with home networks. No pricing information is out yet.

Global Converging Technologies is also working on a wireless tablet for Web surfing, the Cendis Net Display, to arrive in the summer of 1999. It will be touch-sensitive and priced around \$500. The Cendis Net Display, unlike the Cyrix WebPad, will have a monochrome display.

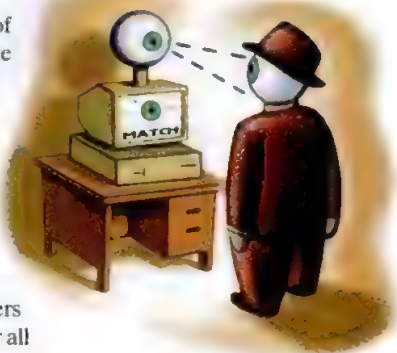
Bio-Identities

Biometric identification systems—which rely on fingerprints, voice prints, retinal scans, and the identification of other unique attributes you carry around—are slowly making the transition out of the exotic stage and into the mainstream.

To move product development along, Microsoft and a group of software companies have come up with BioAPI (*API* stands for *application programming interface*), a tool that software developers can use to build support for all sorts of biometric devices right into their applications. Today developers need to write support for specific biometric devices and force their customers to use certain hardware.

A standard such as BioAPI

can offer complete interoperability between applications and any biometric gadget—a key ingredient that will help broaden



the market, says Karan Khanna, lead product manager for Windows Security at Microsoft. The proposal is only in the initial stages now, with product development a year away.

THIS ISSUE'S CONTRIBUTORS: Angela Hickman, Carol Levin, Sebastian Rupley, Don Willmott.

Personal Projection

Worldwide sales of ultra-portable projectors—models that weigh under 10 pounds—grew nearly 400 percent from 1997 to 1998, according to the market research firm Pacific Media Associates. The ultraportable market should nearly double by next year, reaching almost \$1 billion in sales, according to Pacific Media.

Key to this growth is that these projectors weigh less than half as much as competing designs, while offering many of the same features and, in some cases, brighter images. Low price is also a factor. Released nearly two years ago, the Lightware VP800 remains one of the



PRESENTING: The 6.8-pound InFocus LP425 is one of the lightest projectors you can buy.

best-selling projectors for professionals. Sales shot up last year when Lightware lowered the price to \$3,000—unprecedented in a market where most projectors were closer to \$10,000. The unit now sells for under \$2,000.

Soon you'll be able to carry a notebook and a projector that together will weigh less than a laptop did just a few years ago.

Top-Selling Retail Software

- 1 Sony MVC-FD71 (\$670)
- 2 Agfa ePhoto 307 (\$160)
- 3 Sony MVC-FD81 (\$790)
- 4 Kodak DC-50 (\$210)
- 5 Kodak DC-280 (\$940)
- 6 Sony MVC-FD61 (\$480)
- 7 Kodak DC-210+ (\$575)
- 8 Olympus D-800L (\$860)
- 9 Kodak DC-200 (\$390)
- 10 HP Photosmart C-20 (\$380)

Source: ZD Market Intelligence; data for October.

E-Shopping Arrives

While the final numbers won't be compiled for another couple of months, 1998 appears to have marked the arrival of big-time e-commerce revenues. According to Cyber-Dialogue, a research firm, about 6.7 million adults shopped online in 1998. According to America Online, nearly 50 percent of its 14 million subscribers have shopped online, with the numbers sharply increasing during the last quarter of 1998. A big boost came during the holiday season as major retailers such as Nordstrom offered online shopping options.

Online Trading Rings Up Profits



As the number of online investors soars (it was up 73 percent in 1998 over 1997), full-service brokerage firms will face growing pressure to offer online trading and lower commissions to match Web start-ups, according to market research firm IDC. In 1998, online brokers collected \$1.28 billion in transaction-based revenue, and they're expected to generate over \$5 billion in commission fees in 2002.



* Projected.

Source: IDC, 1998.

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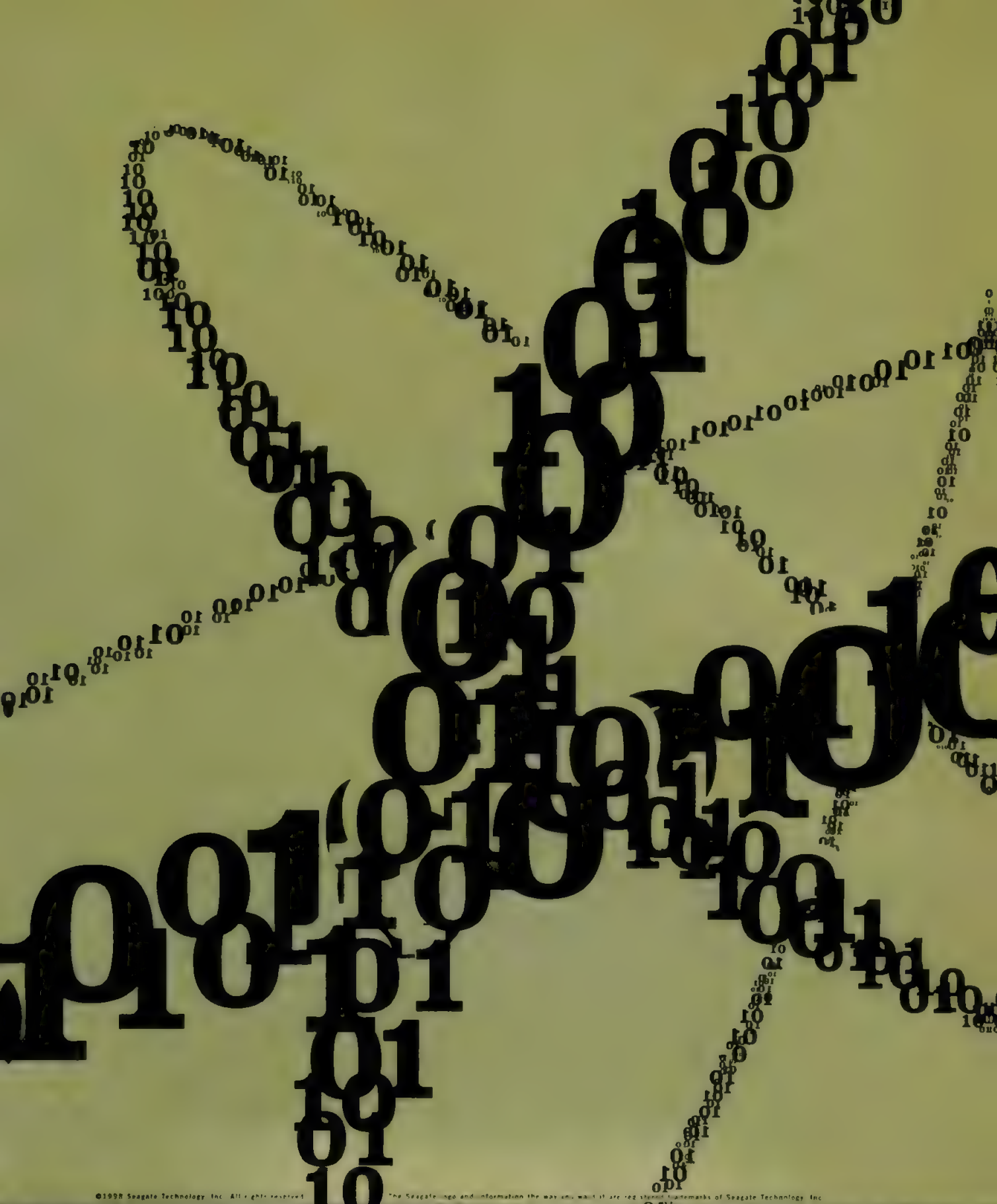
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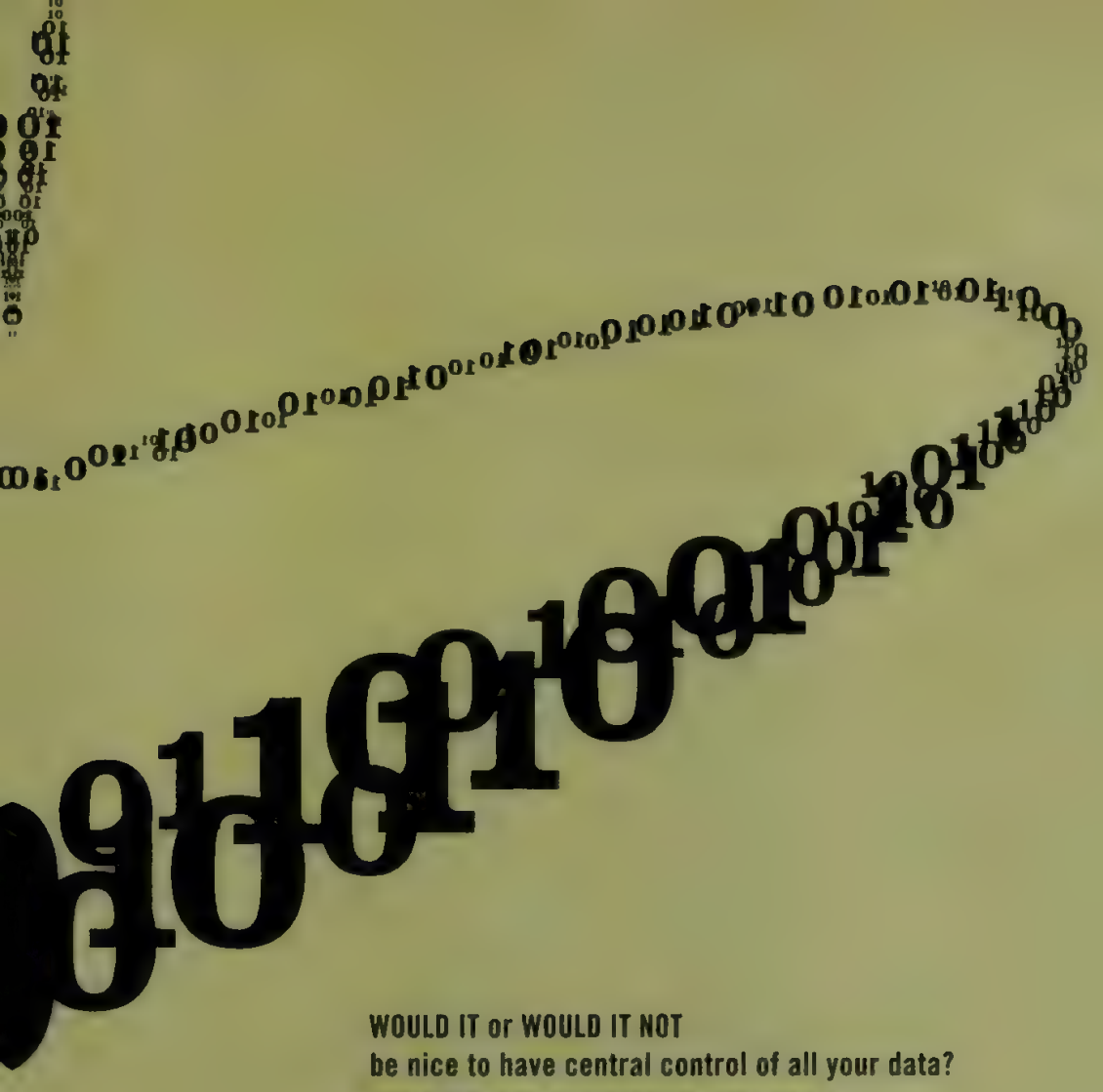
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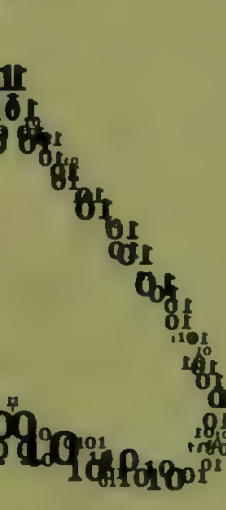
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Subscription rates. The one-year rate (22 issues) is \$49.97 in the U.S., \$85.97 elsewhere. Make checks payable to PC Magazine; U.S. currency only.

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LETTERS

ELEMENTARY SEARCHING

Thanks for the excellent review of Web search sites ("Find It on the Web," December 1, 1998). I'm sure you finished the article before Sherlock was out on the Mac OS 8.5 platform. Sherlock offers some interesting search features, including the standard Find feature, a new way to search your hard disk files by content, and a built-in metasearch engine of Internet sites. So far I have not come away empty on any of my searches. Indeed, as suggested in your article, search techniques are getting better.

CONRAD WEILER
Camp Sherman, Oregon

I challenge any search engine to beat Inference Find (www.infind.com). A friend introduced me to this search engine a few weeks ago. I use it exclusively now. It has more features than I can name here and better performance than any of the engines you report on. You missed out big-time when you passed this one over.

DAVID LARSON
via the Internet

E-BOOK 'EM

Perhaps the makers of the two electronic books featured in your Trends story "Read 'Em and...Beep" (December 1) could explain to their target markets why they expect us to pay \$300 to \$500 for what is actually a glorified book binding. After paying this large amount of money, we will then have to pay \$20 each for books that we must eventually delete to make room for other books. The benefit of paying more than the cost of most print books to download a book to a device that weighs more than a book, is more fragile than a book, and, if lost or damaged, costs more to replace than a book is not very apparent to me.

BRANDON HORN
Linden, NJ

Add another negative point to your review of electronic books: the lack of full-text search capability. This is the single most important value-added feature that an electronic book can provide. When do I use Project Gutenberg e-text? When I'm doing a paper on a Shakespeare play and want to zoom right to all instances of the word *honour*. That is what makes electronic books invaluable, not their ability to let you read the latest Stephen King novel at the beach.

SHANE "SPED" ERSTAD
via the Internet

I read with great interest John C. Dvorak's article on e-books in the December 1 issue ("The Next Really Bad Idea"). Sadly, Dvorak entirely misses a crucial point: E-books can be a blessing for the visually impaired.

The ability of an e-book display to be zoomed would let hundreds of thousands of visually impaired readers adjust print size to their own needs. This, combined with the extraordinary convenience of a CD-ROM library, would free visually impaired readers from the logistical problems of borrowing and returning large-print library books, and from finding that printed copy often is too large or too small for their individual needs.

BOB RICHARDSON
via the Internet

BRING BACK THE OLD LOOK!

When I opened your December 1 issue I beheld large, bright-colored boxes with cute pictures. Presumably these are the "more visual looks" of which Michael J. Miller

Please don't start sacrificing your substantive content for cuteness.

boasted in his column ("The More Things Change..."). Worse, accompanying this increased emphasis on graphics fluff has been a loss of content. PC Tech/Utilities, for example, has been demoted to little more than a Web site reference. *PC Magazine's* strength has always been its substantive content. Please don't start sacrificing content for cuteness.

CHRISTOPHER M. MISLOW
via the Internet

SPEED THE VIDEO

Regarding your graphics cards story "Who's the Fastest?" (December 1), I must commend you for your top-notch testing procedures. One thing I wonder about is how much faster these cards are compared with those of the past. This question is difficult to answer, because as the graphics card industry has produced faster and faster video boards, *PC Magazine* has developed successively more intensive video benchmark tests.

Many of your readers would be interested in seeing *PC Magazine* do a video roundup of graphics cards that were great in their time.

CHRISTOPHER S. MOONEY
via the Internet

When I read your roundup of graphics accelerators, I was shocked to see that the Matrox Millennium G200 was selected as your Editors' Choice. You should try the card with Super Socket Seven boards; you would find that it does not function so well. I have had little or no success with this card and a Giga-

byte G5AX board with a K6-2 processor. After installing an ATI card, though, I have had no problems.

ROBERT FOGEL
via the Internet

Thanks for bringing this subject to our attention. Since we didn't test the graphics accelerators on a Super Socket Seven machine, we can't draw any conclusions. It is difficult to test all of the products in the roundup on an exhaustive set of test-beds, so we chose a test-bed of Pentium II/400-class machines, reflecting the most prevalent platform that is currently shipping.—Ed.

LEVEL THE TESTING FIELD

In your story "The Best PC" (December 1), you were quick to slam the AMD K6 PC, but you are comparing a Pentium II/450 and an AMD K6/300. That's like comparing apples and oranges. The lowest Pentium II speed used in your testing is 400 MHz, but the highest K6 speed is 350 MHz. Why didn't you benchmark-test the K6 against a Pentium II/300 and Pentium II/350 to produce a more accurate picture?

THOMAS J. CHUDYBA
via the Internet

For this roundup of professional/enthusiast PCs, we asked for machines with top-of-the-line processors. Thus vendors sent in systems using the fastest available Pentium IIs (400 and 450 MHz) and the fastest available AMD K6s (300 and 350 MHz). Our intent was to review the latest PCs, not processors per se. (For a comparative review of processors, see "The Best CPU for You," September 22). Though we did point out that the fastest K6s are still slower than the fastest Pentium IIs, we also acknowledged that K6 systems are generally cheaper than their Pentium II counterparts.—Ed.

UNLUCKY CHARMS

After reading your article "Software in Your Cereal" (Trends, December 1), I wondered: Say I purchase a piece of software through Channelware, then my computer decides to throw a shoe and I have to replace the motherboard. Do I have to repurchase the software? If Windows decides it no longer wants to operate, do I have to buy the software again? Sounds like a new way for companies to scam the unknowing public.

TIM HERRICK
Mentor, Ohio



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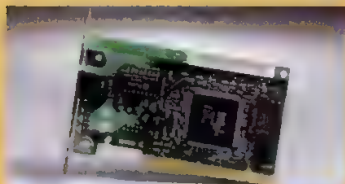
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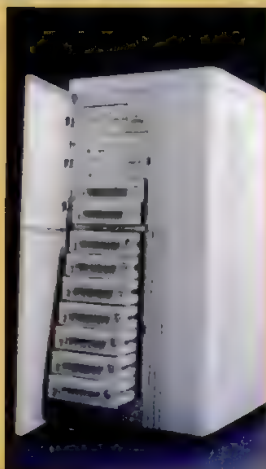
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This system bugs me for a couple of reasons (no pun intended). The first and most obvious is that it may ruin the retail stores that rely on software sales. What will these stores do when a consumer can go down to the local newsstand and buy a new edition of Graphic Artist with Adobe Photoshop 5.0 included in it?

Second is the implementation of the idea. Do software developers have so little faith in the intelligence of pirates as to think they won't be able to create a 20K patch file that could unlock a CD? And if the file identifies a user by checking for five things unique to a system, what happens when the user upgrades? A simple upgrade can change the entire makeup of a system so that electronically, the system would appear to be completely different. Channelware gets an A for effort, but the company failed to think this idea all the way through before publicizing it.

MIKE AARON
via the Internet

BETA MANAGEMENT

In your article on desktop management suites ("Taming the PC Jungle," December 1), you reviewed Microsoft SMS 2.0, Beta 2, as if it were a real product. Beta software is always going to have features the final releases will not have. And the review of Z.E.N.works 1.0 seemed to suggest that the software is a bad solution because of its dependence on NDS. I imagine if SMS had been linked to Microsoft's ActiveDirectory (also beta software), then it would have been heralded as a great solution!

DAVID S. POOLE
via the Internet

NET BUYING POWER

Thanks for your article "Buy It on the Web" (November 17). I went to all the sites you re-

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Corrections and Amplifications

In the story "Corporate PCs" in the December 1 issue, in our Summary of Features table (page 177) the Dell OptiPlex GX1p should be listed with a 40X—not a 32X—CD-ROM drive; also, neither Dell system has any AGP slots. And Dell OptiPlex units come with a three-year warranty that includes three full years of on-site service, not a parts exchange or return of units, as stated in the review. In the same story, the name of one of the DTK systems was misprinted twice. On page 186, it is first referred to as the DTK APRI-78M/P288; on the benchmark test table, it is called the DTK APRI-80M/P286 (PII/333). The correct name is the DTK APRI-80M/P286.

In the story "Graphics Accelerators: Who's the Fastest?" (December 1), in the performance test table on page 238, the STB Velocity 4400's Video Bandwidth Index should have been given as 90.2 percent, not 80.8.

In the story "17- and 19-Inch Monitors: Bigger and Better" in the October 6 issue, we tested, reviewed, and awarded the Editors' Choice to the Iiyama VisionMaster 450, not the VisionMaster Pro 450, as it was called throughout the article.

viewed to compare prices for a digital camera I was interested in; sure enough, your Editors' Choice for computer hardware [NECX] had the best price, \$100 lower than the price at the best retail store in my area. Considering the savings in sales tax, I'm planning to make most of my hardware purchases in this way.

STEVEN BRAS
Seattle, Washington

Comparing prices for 27-inch televisions at two of your highly rated sites, NetMarket and Shopping.com, quickly convinced me that locally advertised sale prices including local taxes were less than the prices plus shipping charges from these two online stores. Similarly, I have routinely found much better prices for computer equipment both locally and online than at NECX. The lesson here is: Never assume you're getting a bargain by shopping online. Comparative shopping, both locally and on the Web, is still a necessity.

GEORGE DIAK
via the Internet

As a veteran online shopper, I suggest that you pass along this bit of information to readers who are considering trying one of the auction sites you outline. I am relatively new to the Web auction scene and have managed to bid successfully on only one item. This is certainly not for lack of trying.

The problem? I am being usurped by people who insist on bidding more for goods at eBay than they would pay at a retail store and much more than they would pay at most of the Web sites you describe in your article. Although I agree that the auctions are fun, paying more for an item just for the fun of it makes no sense at all.

MICHAEL F. MCNERNEY
via the Internet

COLOR IS NOT ENOUGH

PC Magazine frequently has charts and tables that use color to indicate answers. For example, in the November 3, 1998, issue, you ran a Summary of Features table comparing NetWare 5 with Windows NT 4.0 ("Novell's NetWare Turns 5," First Looks, page 48). You used two colors, which my daughter tells me are purple

and green, to distinguish between yes and no. Like many, I am partially color-blind. Except in very bright light, I cannot tell the difference between those colors. It would be helpful to color-blind readers if you used more than color alone to distinguish features and performance.

DAVID M. WALLIS
via the Internet

VISIONARY HOWARD

Hooray to Bill Howard for his column "The Vision Thing" (December 1). As an engineer, I spent decades in labs, and I remember the glorious days of the fifties, when those wonderful pieces of test equipment were actually usable. Sure, they were short on performance and features, and it took a forklift to move them. But you could read the labels, and even a large-fisted tech could wrap his fingers around the knobs.

My top design pet peeve, however, is shrink-wrapped packages that require a machete to open them. I suggest we encase package designers in their own packages; if they can't escape within a week, replace them.

PHIL BILLINGTON
via the Internet

SOMEONE'S BEEN READING MY COLUMN...

I've been reading PC Magazine practically since Issue 1. I love the magazine and the columnists. But something really cracked me up in your November 17 issue. In his column, Jim Seymour writes of Adobe Photoshop that "it's still a bear to use"; following, three pages later, is Bill Howard's observation that Photoshop is "a bear to learn, and unless you use it continually, you lose it."

Bill, meet Jim. Jim, meet Bill.

DEREK VILJOEN
via the Internet

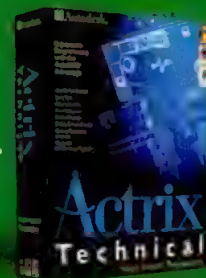
ONLINE EXCELLENCE

Just writing to say that your Web site has been excellent the past week. The articles on professional and corporate computers, graphics accelerators, and finding stuff on the Web have been spot-on. Keep up the great work and I'll keep coming back to your site.

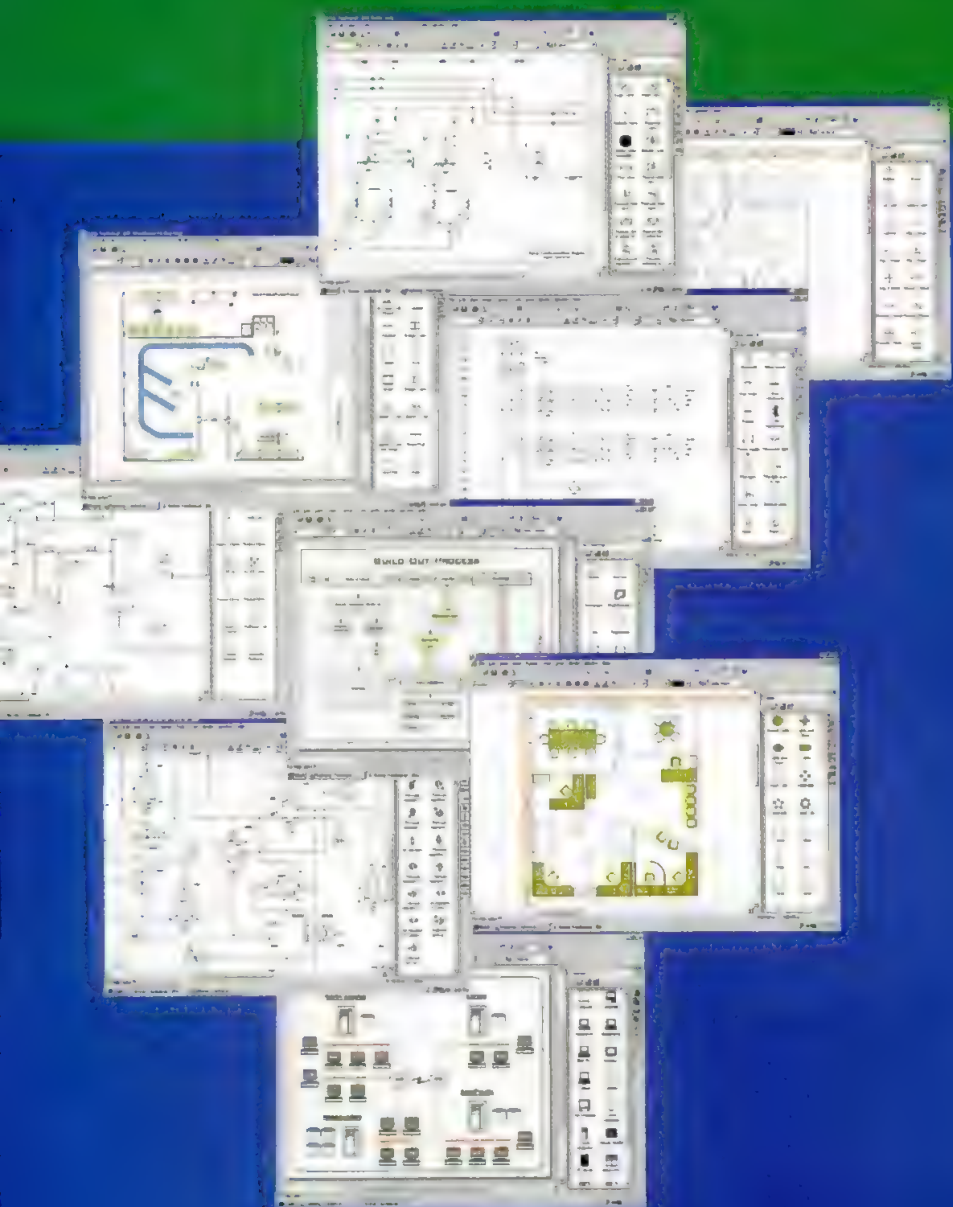
MARTIN NAVARRE
via the Internet

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The background of the advertisement is a high-contrast, artistic photograph of a hard drive platter. The image shows the concentric tracks of the platter, which are illuminated with a bright blue light, creating a series of glowing, curved lines that sweep across the frame. The lighting is dramatic, with deep shadows and bright highlights, giving the image a sense of depth and motion. The overall color palette is dominated by dark blues and blacks, with the glowing tracks providing a stark contrast.

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Family Ties

Phone-line and wireless networks will coexist in homes.

Almost overnight, that reliable old phone line in your home has turned into a life-line that can connect all your PCs under a single roof. And to put to work all the unused bandwidth in copper phone wire, networking developers are floating trial balloons at a breakneck pace and preparing to launch phone-line products in the coming months.

The real fun will likely begin later this year and next year, as prices drop even lower, new chips are introduced for ever-faster connections, and PC manufacturers start shipping home network-ready PCs.

Until recently, home networking was (for all practical purposes) restricted to early adopters who enjoyed experimenting with bleeding-edge technology, ripping out baseboards, and laying Category 5 wiring to construct 100-Mbps Ethernet networks.

Today home networking is an option for anyone with a phone, more than one computer, and the wherewithal to add a PCI card, and even that's changing. NetGear plans to have a USB product available in 1999, and PC makers are now designing new PCs with phone-line networking chips right on the motherboards.

Two simple facts are driving this trend: More and more homes have multiple PCs, and no family member wants to wait in line to get on the Web. In the past, printer and file sharing were the only reasons to set up a home network. Now the real draw is simultaneous Web access from multiple PCs over a single account. According to research from Intel, home PCs are used mostly between dinnertime and bedtime, perfect timing for a nightly tug-of-war over the coveted Web connection.

And with prices of PCs dropping to new lows, multiple PC purchases are more common. Market research firm Dataquest estimates that there are now more than 15 million U.S. homes with two or more PCs, and it predicts that this number will grow to 28 million by 2003.

BY THE PATIO OR THE POOL

Most developers agree that both a wireless radio-frequency (RF) and a phone-line system—which runs concurrently with your



phone service and doesn't interfere with voice calls—will be able to coexist under one roof. (The slower and interference-prone power-line networking systems have taken a back seat for the time being.) Phone-line is less expensive than RF—\$100 per PC compared with several hundred dollars per PC—but RF offers the benefit of mobility.

Your networked household may have an RF product such as the Proxim Symphony wirelessly connecting your notebook with the PC in the den, which may happen to have a high-speed DSL modem. That way you can take your notebook out back and surf the Web by the pool or on the patio. Widespread deployment of DSL service has already begun, and the ability to share a single account among multiple PCs makes the monthly cost more palatable.

Meanwhile, the computers in the home office and the kids' rooms can run Diamond Multimedia's or NetGear's upcoming phone-line products, which plug right into the phone jacks. And with the upcoming Philips Ambi, which transmits radio-frequency signals up to

150 feet from a transmitter on a PC to a receiver on a TV, you can turn the TV into another node on your network. Designed to run at 120 Mbps, the Ambi uses wavelet compression technology from Share-wave to transmit text, audio, video, and graphics.

The high price of RF has opened a window of opportunity for the first generation of phone-line products. They use Tut Systems' 1-Mbps Home-Run technology, which runs at 18 times the speed of a 56-Kbps modem and costs around \$100 per PC. Thanks to an upcoming phone-line networking chip set from Epigram called the Inside Line, the next round of products will run at up to 10 Mbps. NetGear and others plan to incorporate the chip in products due in the second half of the year.

Chip makers are also laying the groundwork for widespread adoption of phone-line networking by helping to make new PCs home network-ready. Intel has started shipping samples of its Phoneline/Ethernet component—based on Tut Systems' 1-Mbps technology—to PC and peripheral manufacturers, which can plug the component directly into motherboards and adapter cards. And Lucent Technologies recently announced its Home Wire phone-line chip, which is also based on Tut Systems' technology. AMD, AT&T, Compaq, Epigram, Hewlett-Packard, IBM, Intel, Lucent Technologies, Rockwell Semiconductor Systems, 3Com, and Tut Systems are all members of the Home Phone Networking Alliance.

The cost of home networking has worked its way down significantly, but it may not have bottomed out yet. "All the developers want to get the price down to \$50 a PC," says Bruce Kasrel, a senior analyst at Forrester Research. "For real mass acceptance," he says, "consumers need to not notice the price. It has to be free."—Carol Levin

Raw Iron

As was expected, Microsoft and Oracle grabbed the software spotlight at this year's Fall Comdex trade show as they delivered their new database offerings: Microsoft SQL Server 7.0 and Oracle 8i. (For details see "Dueling Databases" in Trends, January 5, 1999.) Oracle, in particular, served up some surprises. In a move that highlights the company's effort to promote the NC (network computer) as a better computing device than the PC, Oracle has formed partnerships with several hardware manufacturers to produce a device based on its database software in lieu of Microsoft's operating-system software.

At the show, Oracle announced that it's working with hardware makers Dell Computer, Hewlett-Packard, and Sun Microsystems to build Oracle-only machines and ship the

first ones by April 1999. The machines, dubbed *server appliances* and code-named **Raw Iron**, would run a stripped-down operating system codeveloped by Oracle and an unnamed partner and would include the minimum hardware necessary to run Oracle databases. The machines would attach directly to a server running Oracle 8i, which incorporates many operating system-like features (including a complete file system) and extra functionality such as Web server

features. Oracle foresees

this implementation eliminating the need for Windows NT.

"If the only thing you're running on the server is Oracle 8i," says Oracle CEO Larry Ellison, "you don't need much of an operating system; you certainly don't need an operating system like Windows NT or any other full-blown complex OS."

Microsoft, though, says Oracle 8i bites off more than it can chew. SQL Server product manager Tom Kreyche questions whether packing Oracle 8i with OS-like features may slow it down considerably. "Oracle 8i may confuse and alienate database administrators seeking performance and stability," he says. "We're looking to NT, Index Server technology, middleware, and other products to efficiently handle much of what Oracle is trying to do directly within the database."—*Sebastian Rupley*



PC Magazine Labs' recent exploratory testing of USB speaker technology—using systems from Altec-Lansing, Labtec, and Microsoft—revealed that audio playback is clean when it works but that plenty of growing pains exist.

Audio subsystems must be engineered for smooth playback under adverse system conditions, which is tough when you're passing digital data through system buses and CPUs. Most of the problems we experienced during testing were related to USB implementation issues within Windows 98, chip sets, and BIOS code. Here are some issues to consider before you buy a set of USB speakers.

Don't assume that your PC's USB ports automatically support connection of USB speakers. In fact, some speaker vendors have told us that in some PCs with physical USB ports, either the ports aren't connected to the USB host controllers built into the chip sets, or the systems use chip sets without USB support. You also might find that your system has properly connected USB ports but your BIOS hasn't enabled the ports. You can fix this in CMOS setup, but if you use an operating system prior to Windows 95 OSR 2.1, without the *Usbsupp.exe* upgrade applied, you probably won't be able to connect USB devices readily.

A required feature for digital audio playback through USB is reading digital audio data (Red Book audio) directly off a music CD's surface or CD-ROM disk surface. This is called *digital audio extraction* (DAE), and many older CD-ROM drives prior to the 24X series don't support

it. Microsoft says 50 percent of the installed base of CD-ROM drives support DAE. We find that estimate aggressive, given that 24X and faster CD-ROM drives have shipped in volume for under two years.

To ship Windows 98 on time, Microsoft had to cut some features, and one of those features was support for DAE on SCSI drives. This means you can't play music CDs from SCSI drives through USB speakers. Plexor has come up with a workaround, bundling with its SCSI CD-ROM subsystems an application that can read Red Book audio off the surface of music CDs as WAV files. You can play back these files through the USB sound subsystem.

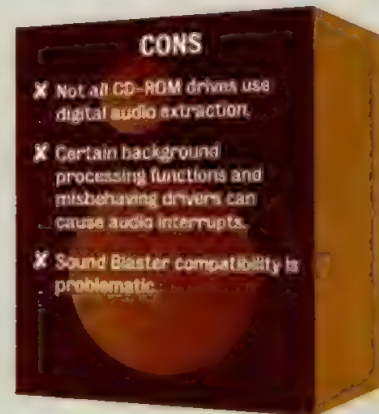
During testing, we experienced skips in CD music playback through USB when opening large TIFF files; that isn't a problem with older analog audio subsystems. On a Pentium II 266-MHz notebook, skips occurred when we accessed the LS-120 floppy disk drive, Windows Explorer, the DOS window, and the My Computer window.

There's still work to be done before 3-D audio works well with USB speakers. No USB speaker currently supports more than two satellite speakers and a subwoofer, and none provides hardware acceleration of DirectSound, DirectSound3D, DirectMusic, or Dolby Digital 5.1 playback.

Even with the initial problems, we were pleased with the excellent sound quality during the problem-free test scenarios. We think that USB audio (or possibly IEEE 1394 audio) will dominate PC configurations as the technology matures, since no sound card is required and audio quality is impressive.—*Nick Stam*

USB Sound Check

Before you rush to buy a set of USB speakers, consider these pros and cons.



The Desktop TV

Digital TV (DTV) is still a mysterious beast, but the computer industry is doing everything possible to tame it. Software and hardware developers—including Compaq, Intel, and Microsoft—are hard at work developing a platform for enabling DTV on PCs.

Initially such a platform would involve integration of data applications into digital TV programs. DTV signals are smaller and better compressed than analog signals. And with the whopping 6-MHz bandwidth over which DTV signals travel, there's enough capacity to deliver all kinds of digital video formats to your screen.

Perhaps while watching a football game on your new DTV-enabled PC, you'd like to download your favorite players' stats and bios. You'll click a button on-screen to down-

load the Web pages or multimedia files to your PC. "Bandwidth is big enough for downloading software applications straight to your PC," says Alfonse Licata, a group product manager at ATI Technologies.

All it takes is a graphics accelerator in your PC that can handle the DTV-format MPEG decoding and a DTV receiver card. The combined solution will run you \$500 to \$1,000, according to Licata, a far cry from the \$5,000-to-\$10,000 price tags of HDTV sets.

On the hardware front, ATI just unveiled the RAGE 128, a graphics chip that card vendors can integrate to DTV-enable their wares. At the Fall Comdex trade show, Compaq and Panasonic unveiled a two-card DTV tuner/decoder for PCs that uses ATI's chip. Further, Hitachi America and Intel are devel-

COMPANY	PRODUCT	SHIP DATE
Hauppauge Computer Works	WinTV-D	2099
Panasonic Industrial/Compaq	TB1T	2099
Philips Semiconductors	Coney	4099

Upcoming DTV Cards

oping All Format Decoder technology, which will enable PCs to receive and display DTV-formatted content.

ATI is also incorporating its RAGE graphics chips into digital TV set-top boxes, including one from General Instruments. IBM, LSI Logic, Lucent, Philips, PowerTV, and VLSI are also working on chips for digital TVs and set-top boxes.—*Angela Hickman*

Save a Back, Save a Tree

Every morning my teenagers trudge off to school bearing backpacks so weighted down with thick textbooks that I worry about the effect of all that weight on their young bones and muscles. Every morning I watch hundreds of my fellow commuters emerge from the train and drop their newspapers into large bins to be wheeled away for recycling. And every day I have the same thought: This is insane.

Far too much paper—and time and money—is wasted on newspapers that don't last the day, on textbooks that go out of date within a year, and on paperback novels that are read only once. You don't have to be an environmental wacko to know that this paper-based delivery system has to change. Books and newspapers don't have to disappear, but there's good reason to augment paper with increasing amounts of electronic delivery of content.

As you've read in our pages, creators of the new electronic books are rushing their wares to market. We ran a Trends article in our Issue of December 1, 1998 ("Read 'Em and... Beep"), on the Rocket eBook, from NuvoMedia (www.nuvomedia.com), and the SoftBook, from SoftBook Press (www.softbook.com). At Fall Comdex I managed to get my hands on both of those as well as two others then in preproduction: the EB Dedicated Reader, from Everybook (www.everybk.com), and the Millennium Ebook, from Librius (www.librius.com).

I was much more favorably impressed with their potential than I expected to be. When you get one in your hands you get the concept instantly, and you immedi-

ately begin to see how useful they could be.

Imagine your school-age child carrying 2 pounds of electronics rather than 40 pounds of books. Imagine purchasing the latest best-sellers for a fraction of their paper-version costs without having to go to the store or wait for online booksellers to deliver. Imagine going on vacation with one lightweight reader holding half of the dozen books you've been wanting to read, instead of filling your suitcase with 10 pounds of bulky paperbacks.

At this point, the market and the products need development. The electronic books come in different sizes and shapes and target different types of users, from best-seller addicts to technical-documentation users. Their price range is wide, from \$200 to \$1,500. As a result, there's bound to be some early product confusion.

The one major hurdle for this new product is content. The market won't take off until there's a significant number of compelling titles easily available at deep discounts from paper versions. Although prices are quite high now, that should change as more titles become available. When you can download the latest literary blockbuster for \$5 instead of buying it in print for \$24.95, you'll find the electronic book a reasonable purchase.

The good news is that the electronic content is becoming available rapidly. My hunch is that the electronic book may be the gift of the next holiday shopping season. At that point we'll have to deal with another downside to electronic books: They threaten to add to the growing divergence of electronic devices. I can see a day not far away when I head out on a trip with a computer bag stuffed with a laptop, a PDA, a cell phone, a pager, an audio CD player, and an electronic book. All in all a load even my kids couldn't shoulder.



Jake Kirchner

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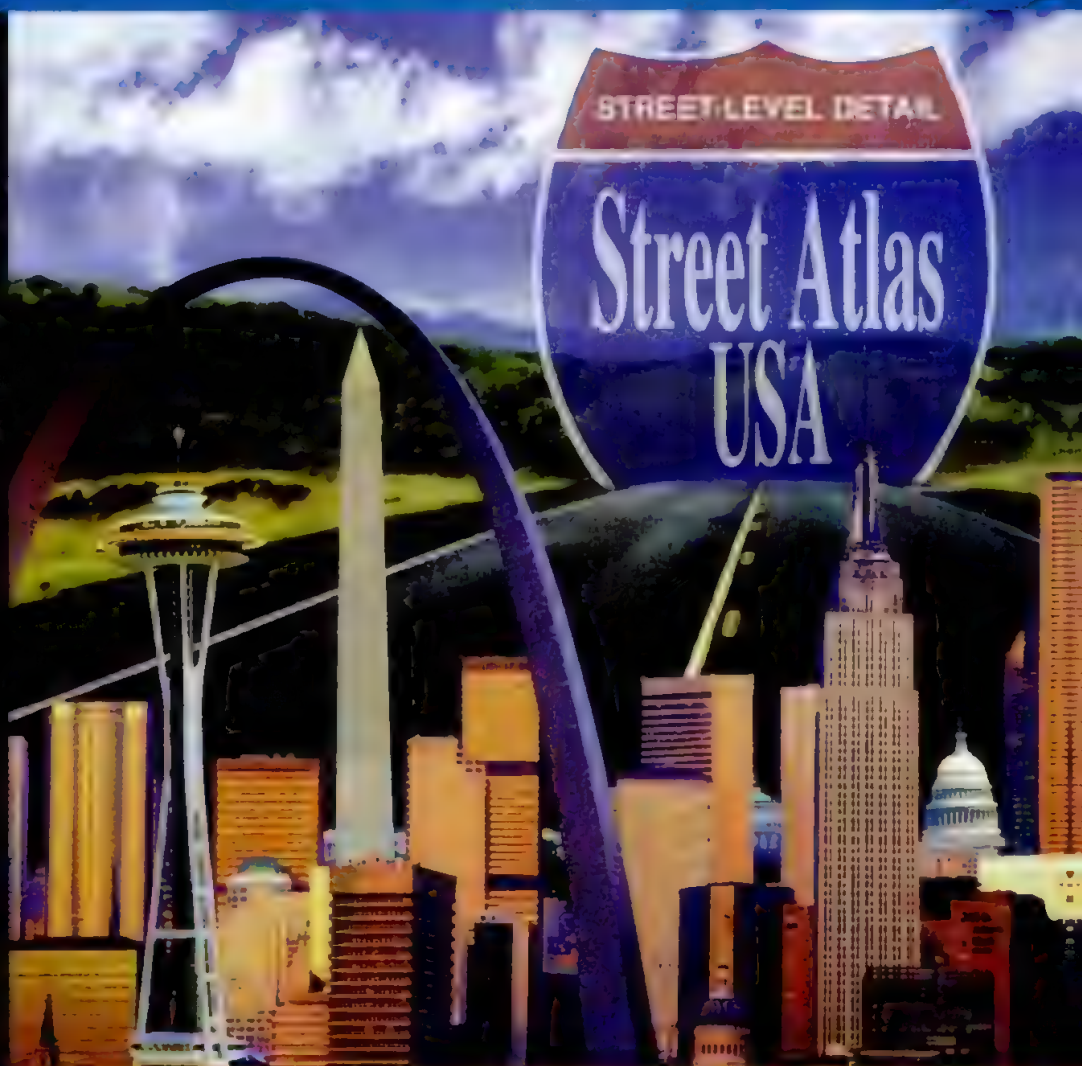


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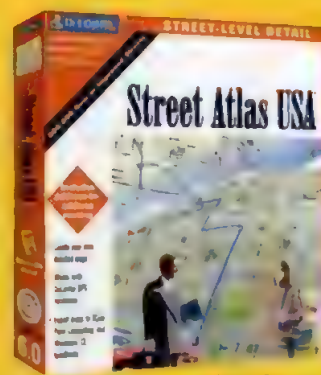
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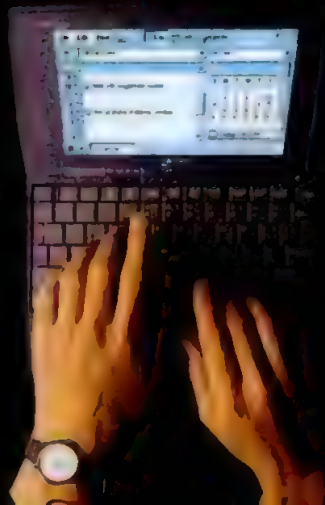
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RESEARCH

Splitting Pixels

Fermi split the atom, and we split the pixel," says Dick Brass, vice president of technology development at Microsoft. Brass is overseeing a research project that promises to make on-screen reading significantly easier and to drive the market for electronic books and hand-held gadgets.

Bill Hill, a researcher and typography expert at Microsoft, recently demonstrated ClearType—a software-based font enhancement technology that significantly improves the appearance of words and graphics on-screen. Microsoft may have its hands on one of the technologies that could revolutionize how we use small computers and personal digital assistants.

Or it may not. Although Microsoft characterizes the technology as a breakthrough, ClearType is based on similar technology that Apple patented 22 years ago when Apple co-founder Steve Wozniak developed a high-resolution display for the Apple II.

To improve resolution, both ClearType and Apple's approach rely on *subpixel addressing*, which capitalizes on the fact that pixels are composed of subelements. Whereas the Apple II's display generated two subpixels per pixel (green or purple), an LCD generates three subpixels per pixel (red, green, or blue).

Since patents are pending, no one at Microsoft is divulging exactly how the technology works, except to explain that it goes beyond manipulating the pixels themselves—which can be only on or off—by addressing subpixel areas. "We create virtual pixels within pixels for better character formation," says Brass.

But Steve Gibson, a developer who built Apple II graphics and hardware back in the 1970s, has posted a description of subpixel rendering on his Web site. "It is my sincere hope," says Gibson, "that Microsoft will acknowledge that they, in fact, rediscovered old and well-proven technology, and that they will not attempt to acquire and/or enforce overly broad patents."

Although the technology behind ClearType may not be the profound discovery that Microsoft claims it is, there's industry-wide consensus that subpixel font rendering offers dramatic improvements over what's in use today. And it may actually make cozying up with an electronic book for a few hours an enjoyable experience.

Font enhancement is usually achieved through a technique known as *anti-aliasing*, which makes some pixels on the edge of a font or line gray to trick the eye into seeing

smoother lines and curves. But image clarity suffers. The technique works on desktop CRT displays but not so well on notebook LCD panels.

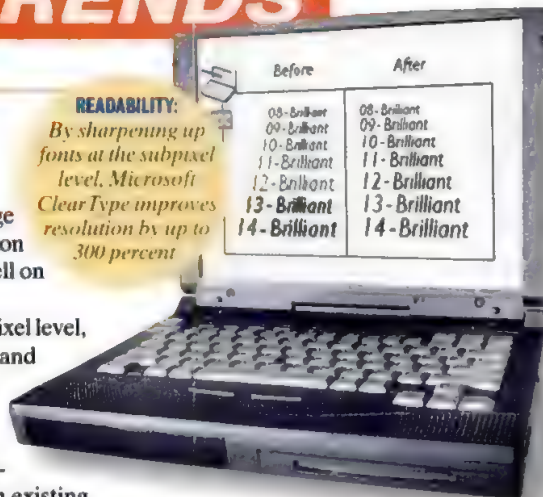
By sharpening up text at the subpixel level, ClearType makes letter shapes and spacing between characters appear more detailed and clear.

According to Microsoft, ClearType improves display resolution by 300 percent and works with existing displays. "ClearType makes an inexpensive screen look like the finest display and the best display look like a paperback book," says Brass.

PC Magazine examined more than half a dozen prototype devices—hand-helds and Windows CE devices, a notebook computer, and desktop flat panel displays. In every case, the improvement was dramatic, and fonts—even at point sizes of 8, 9, and 10—were markedly clearer than fonts without the enhancement. Improvements appeared greatest with smaller italic fonts on all-digital flat panels (such as the ones notebook PCs use). Roman

READABILITY:
By sharpening up fonts at the subpixel level, Microsoft ClearType improves resolution by up to 300 percent

Before	After
08-Brilliant	08-Brilliant
09-Brilliant	09-Brilliant
10-Brilliant	10-Brilliant
11-Brilliant	11-Brilliant
12-Brilliant	12-Brilliant
13-Brilliant	13-Brilliant
14-Brilliant	14-Brilliant



fonts and larger point sizes benefited less, because they were already clearer. Hybrid analog/digital flat panels (most desktop LCDs are analog) also showed benefits, while traditional CRT monitors benefited least.

Electronic books were the initial focus of Microsoft's research, but the potential applications include notebooks, hand-held devices, and possibly even cellular phones and pagers. "We haven't even scratched the surface yet," says Hill. "It's really a fundamental breakthrough."

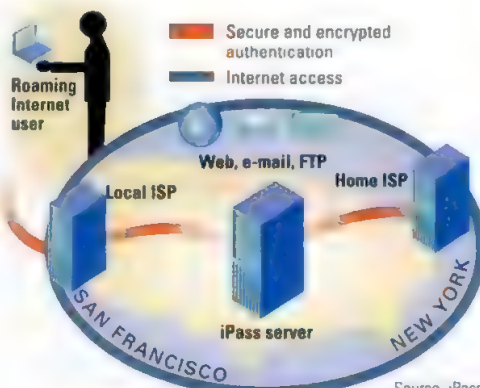
Microsoft expects the technology to be available sometime this year.

—Bill Howard and Carol Levin

TELECOMMUNICATIONS

Roam the Planet

It's a small world, and it's getting smaller thanks to several services that let you connect to the Internet from anywhere for the cost of a local phone call. The idea behind roaming is simple: When you're 1,000 miles away from the office, you should be able to dial into the Internet just as easily—and just as cheaply—as if you were dialing in from right across the street from your office.



Source: iPass

The astronomical cost of corporate remote access is driving this trend. Forrester Research estimates that companies spend an average of \$3,000 to \$5,000 annually per remote user on modem equipment, leased lines, long-distance charges, and toll-free connections.

A new offering from AT&T and Concert Communications Services, a U.S. subsidiary of British Telecom, lets business users dial into corporate networks via the Internet from 40 countries. Global One—a partnership of Deutsche Telekom, France Telecom, and Sprint—now offers Global Remote Dial Access in 60 countries. And iPass offers services in 150 countries. iPass buys Internet access on a pay-per-use basis through a network of ISPs and telecom carriers around the world and resells it to ISPs and corporations (see the diagram).

So when you're abroad and in need of Internet access, you can dial into a local ISP that's a member of the iPass network. Says iPass vice president of marketing Bob Schoettle, iPass can help large corporations save 60 to 80 percent of the cost of a typical corporate remote-access setup.—Angela Hickman

PHOTOGRAPHY BY THOM O'CONNOR

MICROPROCESSORS

Chips That Change Their Spots

As if programming your VCR isn't complicated enough, Xilinx—a chip maker based in San Jose, California—now wants you to reprogram it. Actually, that's not as hard as you'd think. With the emergence of reprogrammable chips, the processes originally wired into a chip for a VCR, for instance, can now be reprogrammed to perform other tasks.

Xilinx has combined a Sun Microsystems Java API with its own programmable chip, called the Virtex, so developers of Internet devices and network appliances can make their wares reprogrammable. The Internet plays a big role in Xilinx's offering. According to market research firm IDC, 500 million Internet-enabled devices—including PCs, TVs, set-top boxes, hand-helds, and even cars—will blast onto the scene in the next few years, and hardware developers will be able to use the Internet to deploy upgrades of their products easily.

The ability to reprogram systems isn't new. Developers have long been enabling their products with reprogrammable flash BIOS, allowing for easy and quick upgrades of adapters, software and hardware drivers, and modems.

Here's how the Virtex might work: Say your daughter wants to run a proprietary video game system via the Java-based set-top box in your living room, which is programmed only to provide WebTV and controls for your home security system. If the set-top box has a Virtex chip, you can reprogram the chip to offer other services, such as your daughter's favorite game. To do that, you would download the application (which would include the code necessary to reprogram the Virtex chip) from the game developer's Web site and then install it on the set-top's Java Virtual Machine.

Other potential applications include bug fixes, hardware enhancements, and entirely new hardware and software functionality delivered via the Internet. Hardware developers who need to keep up with ever-changing protocols will benefit too, says Wallace Westfeldt, a Xilinx product manager. "Virtex chips can provide protocol upgrades as easily as you would upgrade a new flash BIOS," he says.

Elsewhere in Silicon Valley, things are happening at Transmeta, a secretive chip start-up that's financed by Microsoft cofounder Paul Allen and has Linus Torvalds, the inventor of the operating system Linux, on staff. CEO David Ditzel was chief scientist for Sun Microsystems' SPARC Technology Business and spent nine years at AT&T Bell Laboratories,

where he was an architect of the CRISP microprocessor.

Transmeta, formed in 1995, hasn't released any products or details regarding future products, but there's speculation that it's developing an extremely fast chip architecture designed to run many different operating systems and environments. The company recently received a patent from the U.S. Patent and Trademark Office for a chip architecture that, according to industry newsletter *Wave Report*, may be able to run multiple operating systems.

The patent document describes the technology as "a microprocessor comprising a host processor capable of executing a first instruction set, code morphing software for



TRANSMETA: Microsoft cofounder Paul Allen (left) and Linux inventor Linus Torvalds are behind a secretive chip start-up.

translating programs written for a target processor having a second different instruction set into instructions of the first instruction set." According to *Wave Report*, such a chip would theoretically let a PC manufacturer build one computer capable of running many operating systems.

—Angela Hickman and Carol Levin

HAND-HELD S

The Palm Goes Wireless

The 3Com Palm VII—the new addition to 3Com's popular Palm family of hand-held devices—is on the way, and it promises far more Web connectivity than any of its predecessors. Most notably, the Palm VII will provide two-way wireless connectivity for both messaging and Web access. The device will cost about \$800—a somewhat hefty price tag compared with the \$400 Palm III's—and the Internet service will run \$10 per month.

3Com decided to skip the monikers IV, V, and VI to emphasize the significance of the upgrade. But it hasn't ruled out the possibility of giving future products, presumably lower-end ones, those designations.

To launch the Palm VII's communications features, you'll flip the antenna, and a tiny radio will let you send and receive real-time wireless messages. 3Com's service Palm.Net will provide Internet connectivity using Bell South's wireless data network. Initially the service will be available from just about anywhere in the U.S. Down the road, Palm Computing—a division of 3Com—expects to offer it globally.

Palm.Net is designed specifically for the device, so it's different from other Internet

services. Instead of Web surfing, Palm users will *Web clip*, a "new browsing paradigm," says Janice Roberts, acting president of Palm Computing. Web clipping extracts the extraneous parts of the browsing process to minimize power usage and storage requirements.

So far, Palm has partnered with 22 content providers, which will design special forms that will ship with the Palm VII. Those pages will be smaller ("clipped") versions of pages that are available on regular Web sites, and they'll enable the device to send and receive the smallest amount of data possible.

Partners include ABC-News.com, Bank of America, ESPN.com, E*Trade, Fodor's, MapQuest, MasterCard, Merriam-Webster, Moviefone, TheStreet.com, Ticketmaster, Travelocity, UPS, USA Today, U S West, Visa,

The Wall Street Journal Interactive Edition, The Weather Channel, and Yahoo! And by offering support for HTTP and SSL, the Palm VII will let business users access their company intranets and extranets.

Indeed, expectations for the Palm VII are running high. "The Palm VII is poised to change the way you communicate forever," says Roberts. But you'll have to wait until about the middle of next year, when trials are completed, to get one.—Angela Hickman





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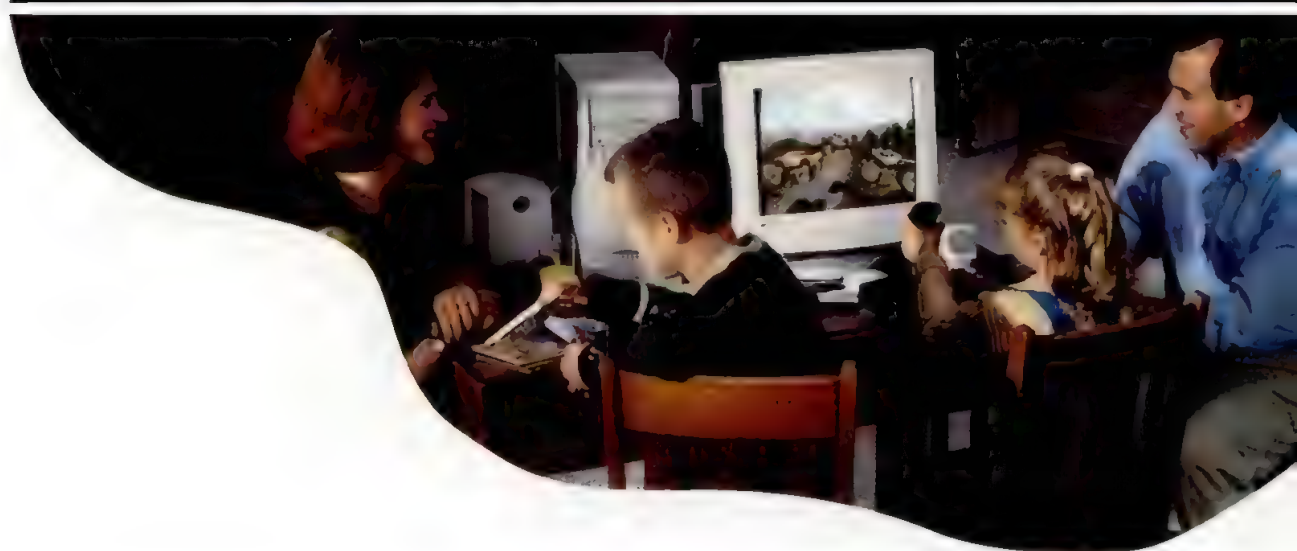


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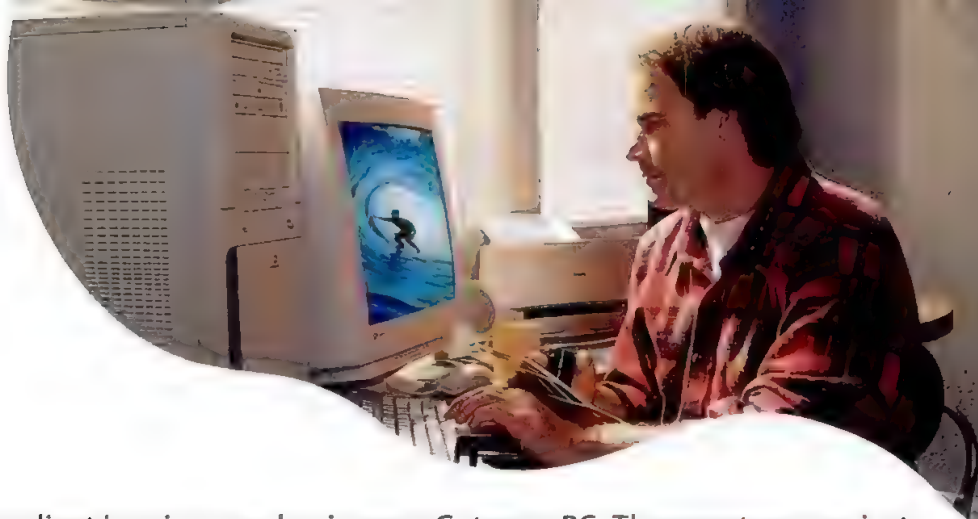


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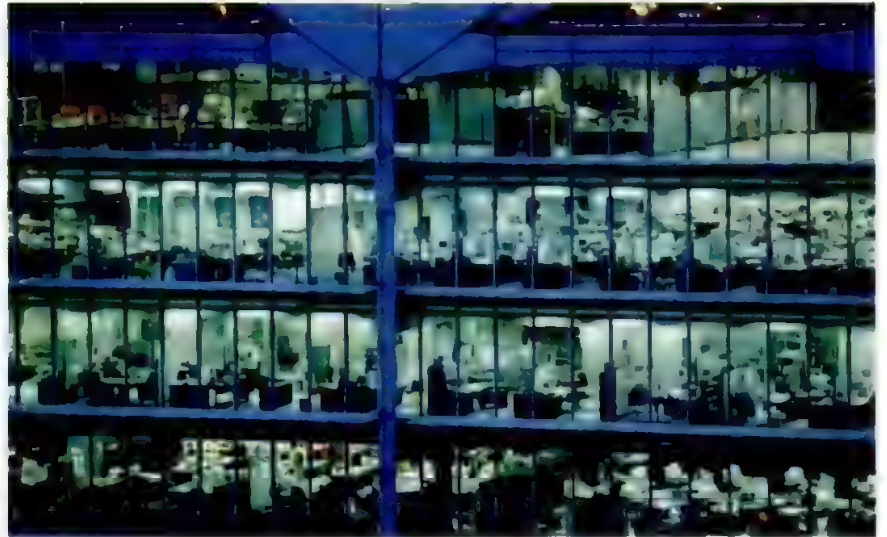
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19-Inch CRTs Flatten Out

PC Magazine Labs tests four new 19-inch flat-screen CRT monitors that boost image accuracy and user control.

By Bruce Brown

The hot shape in desktop displays is flat—not just for LCD-based flat panels, but for a growing number of CRT-based monitors as well. Citing improved image quality and display accuracy, several major vendors have introduced 19-inch flat-screen CRTs.

PC Magazine Labs tested four new 19-inch flat CRTs: the iiyama VisionMaster Pro 450, Mitsubishi Diamond Pro 900u, NEC MultiSync FP950, and Viewsonic's Professional Series PT795. We also tested a final hardware release of a Sony 19-inch flat CRT that will ship in February 1999 (see the sidebar on page 44).

CTX, EIZO-Nanao, Panasonic, and Samsung all have 19-inch flat CRTs in development but were unable to meet our deadline for this story. Look for a raft of introductions in this category from these and other vendors during 1999.

FLATTER IS BETTER

Older curved-display designs can add distortion and glare to screen images, but the march of technological development is likely only part of the reason for the emergence of flat monitors. For other motivations, consider two factors: LCDs and price.

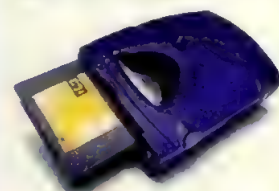
As LCD flat-panel prices approach the budgets of business and consumer buyers (with 14-inch panels nearing the magic

\$500 price level and 15-inch models under \$1,000), CRT manufacturers, most of whom also sell LCD panels, see 19-inch flat CRTs as a chance to make more money from conventional displays. By offering high-quality big-screen monitors at prices ranging from \$600 to \$1,000, manufacturers appeal to consumers used to buying monitors in that price range.

The monitors in this roundup all use aperture grill tubes with a stripe pitch of 0.25mm in the center of the screen, varying to 0.27mm in the corners. All can run in noninterlaced mode at 1,600-by-1,200 resolution with vertical refresh rates of 75 Hz or above. Two monitors, the NEC and Viewsonic, support 1,920-

A BIGGER ZIP:

Read our exclusive review of the new portable Iomega Zip 250 SCSI Drive. *Page 51.*



MIX MASTER:

Make your own compilations of MP3 tracks and take them on the road with the Diamond Rio PMP300 Portable Music Player. *Page 51.*



SUN UP:

Solaris 7.0 adds increased usability and integration to the already robust operating system. *Page 75.*



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FIRST LOOKS

by-1,440 resolution without flicker. The stripe pitch in these monitors is a bit large for their maximum resolutions but great for the 1,280-by-1,024 mode we used in testing.

TESTING

To test this new crop of monitors, PC Labs used test screens from Sonera Technologies' DisplayMate for Windows Professional Multimedia Edition Version 2.0, plus a selection of high-resolution photographic images viewed with Adobe Photoshop 5.0. On all the monitors, the photos looked gorgeous, with sharp details and realistic colors. Minor—though observable—differences between monitors did appear on the DisplayMate tests, however.

Three of the four tested monitors have USB ports. The Mitsubishi and NEC units use upstream ports for PC-based monitor adjustments—a handy feature. The Mitsubishi and Viewsonic displays have self-powered USB downstream-port hubs that let you plug in other USB peripherals.

The convenience of these connections isn't entirely a good thing, however. Self-powered USB hubs have to share 500mA of power among the ports, which may not be enough to support combinations of USB devices, depending on their aggregate power draw.

PC peripheral buyers are in-

deed lucky. As component prices drop and pressure increases from competing technologies, high-quality peripherals such as these 19-inch flat-screen CRTs become available at prices that would have purchased moderate quality, curved-screen 17-inch monitors just one year ago.

Iiyama VisionMaster Pro 450

The least expensive monitor in this roundup at \$700 (street), the Iiyama VisionMaster Pro 450 lagged behind the others on image-quality testing. The unit's user controls had an irritatingly short on-screen control adjustment duration, and this monitor was the only one we tested that did not have a standard USB connectivity (USB is a \$99 option). Even with these relative shortcomings, however, the VisionMaster Pro 450 is a fine monitor for the price; it just can't compete with the others we tested.

The aperture grill-based Diamondtron NF CRT used in the VisionMaster Pro 450 has a maximum 1,600-by-1,200 noninterlaced resolution with up to 85 Hz vertical refresh for flickerless performance. The display

has a viewable area of 17.9 inches and is one of the shortest in depth, measuring 17.4 inches. Five BNC connectors and a 15-pin D-sub connector are on the back of the monitor, with all user controls in front.

The Power, Menu, and +, - buttons are used for all display adjustments. A series of five menu levels divides the adjustments logically, but two factors make the process tedious. The on-screen menus disappear after 6 sec-

a bit of moiré patterning at the factory default setting, though we could remove most of it via the horizontal moiré cancellation control.

Color gun convergence was very good, with just a bit of red/blue misconvergence. Tight focus pattern checking showed the VisionMaster Pro 450 to be off slightly compared with the other displays, a difference that was consistent across the screen. Sometimes moiré cancellation

control can distort focus a bit, but turning it off didn't improve the focus.

In a circle matrix test the Iiyama unit showed slightly off-sided squashing in the lower-left corner of the screen. The screen also had observable ringing and overshoot, minor screen halos, and noticeable high-contrast

streaking—all items that won't matter to most users but will to perfectionists. The Iiyama VisionMaster Pro 450 is inexpensive, and its flat-screen quality outperforms most curved-screen displays. But the combination of slightly irksome user controls and just-below-the-bar performance on the DisplayMate tests holds it back from a top rating in this fast group.

High-resolution color-photo images looked great on the Iiyama unit, but on a few of the image-quality tests it didn't perform at the same level as the other monitors. There was quite



Iiyama VisionMaster Pro 450

Street price: \$700

Iiyama North America Inc.,

Costa Mesa, CA;

800-394-4335, 714-437-5111

www.iiyama.com

414 at www.pcmag.com/infoclink

SUMMARY OF FEATURES

19-Inch Flat-Screen Monitors

	Iiyama VisionMaster Pro 450	Mitsubishi Diamond Pro 900u	NEC MultiSync FP950	ViewSonic Professional Series PT795
■ YES ■ NO				
Street price	\$700	\$800	\$900	\$1,000
Viewable screen size (diagonal, in inches)	17.9	18.2	17.9	17.9
Depth (inches)	17.4	18.0	17.0	18.1
Weight (pounds)	66.1	57.3	59.5	60.7
Maximum noninterlaced resolution	1,600 x 1,200	1,600 x 1,200	1,920 x 1,440	1,920 x 1,440
Vertical refresh rate	85 Hz	75 Hz	73 Hz	73 Hz
Video inputs	BNC, VGA	BNC, VGA	BNC, VGA	BNC, VGA
USB ports (upstream/downstream)	0/0	2/3	1/0	1/4
RGB adjustment/Color temperature	■ ■	■ ■	■ ■	■ ■

Mitsubishi Diamond Pro 900u



The \$800 (street) Mitsubishi Diamond Pro 900u's superior image quality, great performance, extensive and precise user controls, and USB connectivity options all add up to make it our Editors' Choice in this roundup.

The 900u offers a new approach to flat-screen technology. Images on earlier flat-screen

**Mitsubishi
Diamond Pro 900u**

Street price: \$800

Mitsubishi Electronics
America Inc., Cypress, CA;
800-843-2515, 714-220-2500
www.mitsubishi-display.com
415 at www.pcmag.com/info/ink

the downstream ports to the appropriate computer's video. Also helpful is that one of the downstream connectors is in front, so you can plug in devices temporarily without having to get to the back of the monitor.

CRTs appeared concave; part of this effect is psychological, because viewers' eyes are used to looking at curved CRTs and trying to make them seem flat. Mitsubishi says that part of the effect is real, however, and is caused by refraction as light passes from the CRT's glass to the air. The 900u compensates by curving the inside of the screen, essentially turning it into a corrective lens.

The Mitsubishi's maximum refresh rate is a flicker-free 88 Hz at 1,280-by-1,024, or 75 Hz at 1,600-by-1,200. BNC and D-sub connectors are on the back of the monitor, with a selector button on front to switch between connected PCs easily.

The on-screen display uses four buttons (menu, proceed, +, -). The on-screen control menu duration is listed at 10 seconds, but in testing lasted 15 seconds, which is plenty of time to adjust the screen. Another helpful characteristic is that the control menu returns to the last selection when it's turned back on.

If you're fussy about image quality, you'll appreciate the large number of controls, particularly for multiple color temperatures. You'll also appreciate the ability to control settings from your computer though a USB connection.

The 900u's self-powered USB hub, which offers two ports upstream and three downstream, lets you control two computers from one USB mouse and keyboard. If you plug one computer into the D-sub connector and another into the BNC connectors, the unit will automatically switch

In DisplayMate testing, the only flaw we found worth mentioning was a minor screen regulation problem, with thin lines moving slightly when a nearby block of white turned on and off. Color gun convergence was excellent, with only the barest minimum of red/blue position difference on the left side. The monitor was notable for its sharp focus (text was easy to read even at 5.4 points) and for its lack of halos, high-contrast streaking, or bright line overshoot.

There's a lot to like in the 900u apart from the flat screen. The high-quality image, wealth of controls, and USB support make this monitor a winner.

NEC MultiSync FP950

Loaded with high-end features, the NEC MultiSync FP950 (\$900 street) is a strong contender in the field of 19-inch flat-screen CRTs. Using NEC's GlobalSync technology to compensate for magnetic fields and on-board DSP control for image geometry, color gun adjustment, and moiré cancellation, the FP950 is a very good choice.

The FP950's aperture grill tube has an 18-inch viewable display area, and its maximum noninterlaced resolution is 1,920-by-1,440 at 73-Hz vertical refresh rate, with 85-Hz refresh at the recommended 1,280-by-1,024 resolution. The monitor's 17-inch cabinet depth is the shortest of the tested monitors.

With the D-sub and BNC connectors in back, the front of the monitor has a full comple-

Editors' Choice

Mitsubishi Diamond Pro 900u



For its winning combination of great image quality, precise user controls, and USB connectivity

and control the Mitsubishi Diamond Pro 900u is our Editors' Choice from this batch of fine monitors. Consistent image quality is the most important factor in monitor evaluation, and across the board, the Diamond Pro 900u was as good or better than the other monitors in DisplayMate testing. The Mitsubishi unit also has a broad range of user controls, notable for a wide range of color temperature settings and its USB PC-based display adjustment.

Although self-powered USB ports aren't good for all applications, the Mitsubishi's front-mounted port is convenient for attaching a digital camera for displaying images on the monitor via PC software (note that this feature doesn't let you hook a camera to a monitor without a PC).

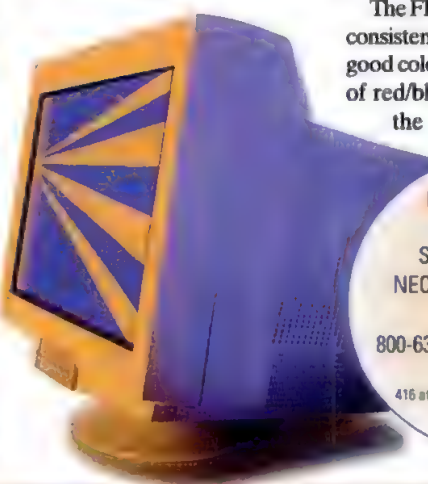
ment of controls, including exit, up, down, left, right, and proceed buttons for on-screen display control, a factory default reset button, and a BNC/D-sub selection button. The first user menu has controls for contrast, brightness, and degaussing.

When you're working with the controls, the menus don't disappear for 30 seconds, which give you ample time for making adjustments. When you turn the menus back on, though, the top menu appears. A single Auto Size control uses the NEC's DSP to maximize image size and geometry based on the in-

coming video signal. A single USB upstream port on the back of the monitor lets you run included software on your PC to adjust the display.

Like the other monitors here, the NEC excelled in displaying color photographic images. In DisplayMate testing, the unit showed great power control during full-screen regulation testing, in which an outer frame line is supposed to remain steady while the middle of the screen pulses a full-white image. The other monitors we tested had minor but observable frame pulsing on this test.

The FP950 also proved to have consistently fine screen focus and good color control, with just a bit of red/blue misconvergence on the sides. We observed



**NEC MultiSync
FP950**

Street price: \$900

NEC Technologies Inc.,
Itasca, IL;

800-632-4636, 630-467-5000

www.nec.com

416 at www.pcmag.com/info/ink

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minor amounts of bright line overshoot, screen haloing, and high-contrast streaking, but not to a degree that was bothersome. We had to look closely to find any display characteristics that weren't perfect.

The NEC MultiSync FP950 is an admirably performing monitor with excellent user controls.

ViewSonic Professional Series PT795

Boasting a screen called "PerfectFlat," the ViewSonic Professional Series PT795's monitor (\$1,000 street) has high-resolution capability, on-screen color-matching controls, and USB connectivity with one upstream and four downstream USB ports. A competitive monitor in DisplayMate testing, the PT795 is the most expensive of the 19-inch flat CRT displays we tested, but it is still a good choice.

The ViewSonic unit has a 17.9-inch viewable area and a maximum noninterlaced resolu-

tion of 1,920-by-1,440 at 73 Hz. At 1,600-by-1,200-resolution the monitor has a maximum refresh rate of 87 Hz, and 101 Hz maximum refresh at 1,280-by-1,024.

The monitor's D-sub and BNC connectors and USB upstream port are located on the back of the case. Two self-powered USB downstream ports are located on each side of the monitor. The placement of the downstream ports is convenient but could make the monitor look like it's sprouting peripherals if you plug devices into each side.

The front-panel user-control buttons include Menu 1 (full control settings), Menu 2 (brightness and contrast), Up and Down menu selection and control buttons, plus a power button. The ViewSonic has five color-temperature control settings and separate horizontal and vertical focus and convergence controls. The second menu for quick access to brightness and contrast controls is a clever design, since those are the

most commonly changed settings after initial setup.

The PT795 performed very well on our DisplayMate tests. We removed almost all the minor moiré patterning via the user

The ViewSonic was a top performer in resolution testing and had only minor screen haloing, horizontal and vertical bright-



ViewSonic Professional Series PT795

Street price: \$1,000

ViewSonic Corp., Walnut, CA;

800-888-8583, 909-869-7976

www.viewsonic.com

417 at www.pcmag.com/infolink

line overshooting, and high-contrast streaking. None of these very minimal problems will matter to or even be noticed by most users.

The ViewSonic Professional Series PT795 is a competitive performer in this new category of 19-inch flat CRTs, but its higher-than-average price is a reason to pause. Since ViewSonic as a company has a tradition of aggressive pricing, it's a fair bet that the price may drop soon. **PC**

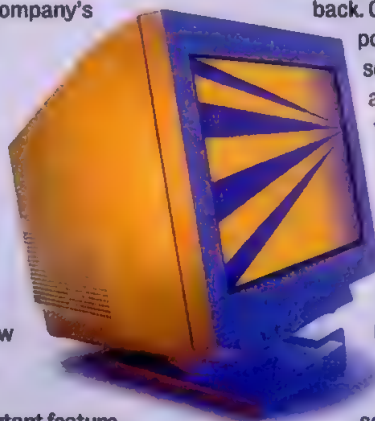
Coming Up: The Sony GDM-F400

The full name for Sony's new 19-inch flat CRT monitor, expected to ship in February 1999, is the Sony Multiscan GDM-F400 Computer Display with FD Trinitron. Using many of the same technologies as the company's 21-inch (19.8-inch viewable) GDM-F500 display, the 19-inch version (17.7-inch viewable) boasts a tight 0.22mm aperture grill pitch on the flat Trinitron CRT. The GDM-F400, which has a maximum noninterlaced resolution of 1,600-by-1,200 at 85 Hz vertical refresh rate, is expected to sell for about \$1,000 on introduction. It's probably good for the shipping models that the Sony is following them to market by a few months, because based on our testing, the GDM-F400 is a top performer.

Aperture grill pitch isn't the only important feature in a monitor, but it's a big one. The Sony also uses the company's HiDensity Electron Gun with Enhanced Elliptical Correction System and GeoLock Plus circuitry, both proprietary technologies that enhance image quality and stability. What these features translated to in testing were impressive images with no noticeable moiré patterning, dead-on color gun convergence, extremely fine focus, no noticeable screen haloing, ringing or

overshoot, very minimal streaking, and great power regulation. In short, this is truly a high-performance monitor:

The Sony has five BNC and a single D-sub connector on the back. On the front you'll find reset, ASC, Input, and



power buttons. The ASC control is a quick way to set up the display's geometry—the letters in the acronym stand for Active Signal Correction but translate to automatic sizing and centering. A tiny three-plane joystick on the front of the monitor is used to navigate, adjust, and activate on-screen menu-based display controls. The design is so intuitive that we learned to use the menus and joystick almost immediately, without having to look at the manual. The Sony has a USB upstream port on the back and four downstream ports (two on each side of the monitor base) located out of the way toward the back, so your desktop won't be cluttered with cables.

The Sony GDM-F400 promises to be an admirable monitor for those willing to pay a slight premium for top-quality performance.

Sony Multiscan GDM-F400 Computer Display with FD Trinitron. Street price: \$1,000. Sony Electronics Inc., San Jose, CA; 800-352-7689; www.sony.com/displays; 418 at www.pcmag.com/infolink.—BB

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Great Web Sites for All

Macromedia makes Dreamweaver 2's advanced feature set accessible to the masses.

By Jan Ozer

Macromedia Dreamweaver debuted as a tool for advanced Web developers, with invaluable features like "round-trip" HTML, which protects hand-tweaked code, Cascading Style Sheets, and easy access to Dynamic HTML (DHTML). But a funny thing happened on the way to Version 2: By adding a site manager and further refining the program's advanced visual design tools, Dreamweaver (\$299 list, \$129 upgrade) morphed into a mainstream program ideal for anyone tired of the table-driven, cookie-cutter Web page look.

INTERFACE TOOLS

The first thing you notice about Dreamweaver 2 is the new site map, a sorely needed visual representation of Web pages and other assets. Along with a familiar tree-based structure showing interpage links, the site map has an Explorer-like file listing of pages and contents that you can drag and drop into your design.

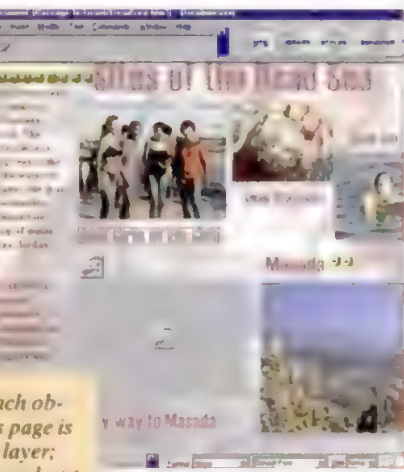
One unique feature is the ability to create and link new pages in the site manager, providing a storyboard for your site. Though Dreamweaver doesn't offer design templates, this feature, plus new Color Schemes, should get novices up and running quickly.

Dreamweaver's interface is otherwise relatively unchanged. You create pages in the WYSIWYG design window by dragging page components from the floating Object Palette and accessing the internal HTML Editor, stylesheet libraries, and other palettes from the floating Launcher Window. Linking is

handled from the property browser, which maintains content-specific data about each design element.

One of Dreamweaver's exquisite strengths is its ability to design with layers, providing

LAYERS: Each object on this page is a separate layer; the two grayed-out files are a Real-Video file and the player control.



pixel-level control over content placement. Select the Draw Layers option in the object panel and then start drawing squares in the design window, with each square being a separate layer. Then you insert content-like graphics or text in the layers.

You can freely move and resize all layers. Designers who rough out Web pages in other programs can input a tracing image to assist in positioning, with the ability to prohibit overlaps that would prevent converting the design to tables for backward compatibility.

With the "round-trip layers to tables" feature, you can then convert your layers to tables for level-3 browsers. Or, if you create your tables in another program, you can convert to layers and then back to tables. Dreamweaver will then eliminate all cells without content, speeding download and display times.

Macromedia also enhanced table support with the ability to cut and paste columns, sort table contents, and format noncontiguous cells. A host of other features, such as constraining your development window to a target view port (like Web TV or an 800-by-600 screen), a new frames inspector, and fields for entering metatags, descriptions, and keyword search data add to Dreamweaver's utility.

ADVANCED FEATURE SET

Macromedia complemented these page-design enhancements with plenty of advanced, under-the-hood features. High-volume publishers will appreciate the template-creation capabilities. You save templates as DWT files, locking fixed regions and leaving others open for page-specific data.

Then you enter data and save each unique page as a separate HTML file. Subsequent template changes flow automatically to the separate pages—a great time saving feature.

Round-trip HTML, a key feature for advanced developers, has been supplemented with

support from vendors like Real Networks that provide Java plug-ins that integrate their controls directly into Dreamweaver's interface, easing accessibility.

Be aware, however, that due to late changes to Dreamweaver, you'll need an update from Macromedia's Web site to make Real Networks' plug-in work. Our experience with the plug-in was rocky, probably the downside of third-party collaboration on a tight schedule.

Relatively unchanged are the style sheet controls, which remain easy to use. Ditto for the timeline controls for creating DHTML behaviors, appropriate since the market has yet to catch up with Version 1 features.

Dreamweaver 2 defines DHTML behaviors by browser level, so you can limit design to your relevant target audience. You can also check the remote user's browser level when loading the page and send various levels to different sites, enabling cutting-edge effects for your advanced users while retaining legacy compatibility.

When it comes to visual design, Dreamweaver is a laser beam in a room full of blunt instruments. Macromedia and third-party extensions provide

an extraordinarily rich feature set. Only complete novices should opt for the cushy comfort of Microsoft FrontPage, and even developers tied to FrontPage's NT Server extensions should consider

designing their pages in Dreamweaver and finishing their work in FrontPage.

Macromedia Dreamweaver 2.

MAP IT OUT:

Dreamweaver's new site manager provides, in essence, a storyboard for your site.



round-trip XML. Since you can use XML fields with templates, database-driven sites can use these features in tandem to display search data easily.

Macromedia also opened up Dreamweaver's programming interface to enable extensibility via Java applets. The program ships with a flurry of third-party

List price: \$299. Requires: 32MB RAM, 20MB hard disk space, Microsoft Windows 95, 98, or NT. Macromedia Corp., San Francisco; 800-236-2128, 415-252-2000; www.macromedia.com; 419 at www.pcmag.com/infolink.



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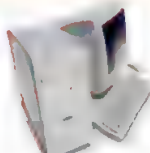
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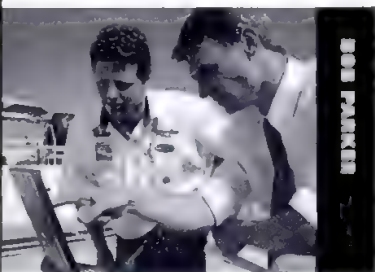
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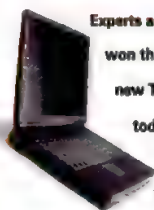
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TREK² 233



TREK² 266



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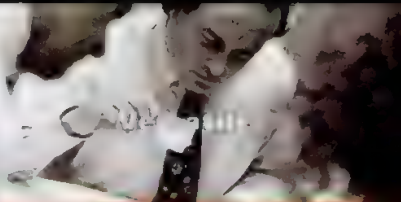
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you're starting to scratch the surface. Let's face it, when you're crawling around under someone's desk in a jungle of twisted cables because they want to see the dancing baby and you're the only one in the office that understands that "hot-swappable hard-drives" aren't something dirty, the last thing you need is a server that's anything but flawless.



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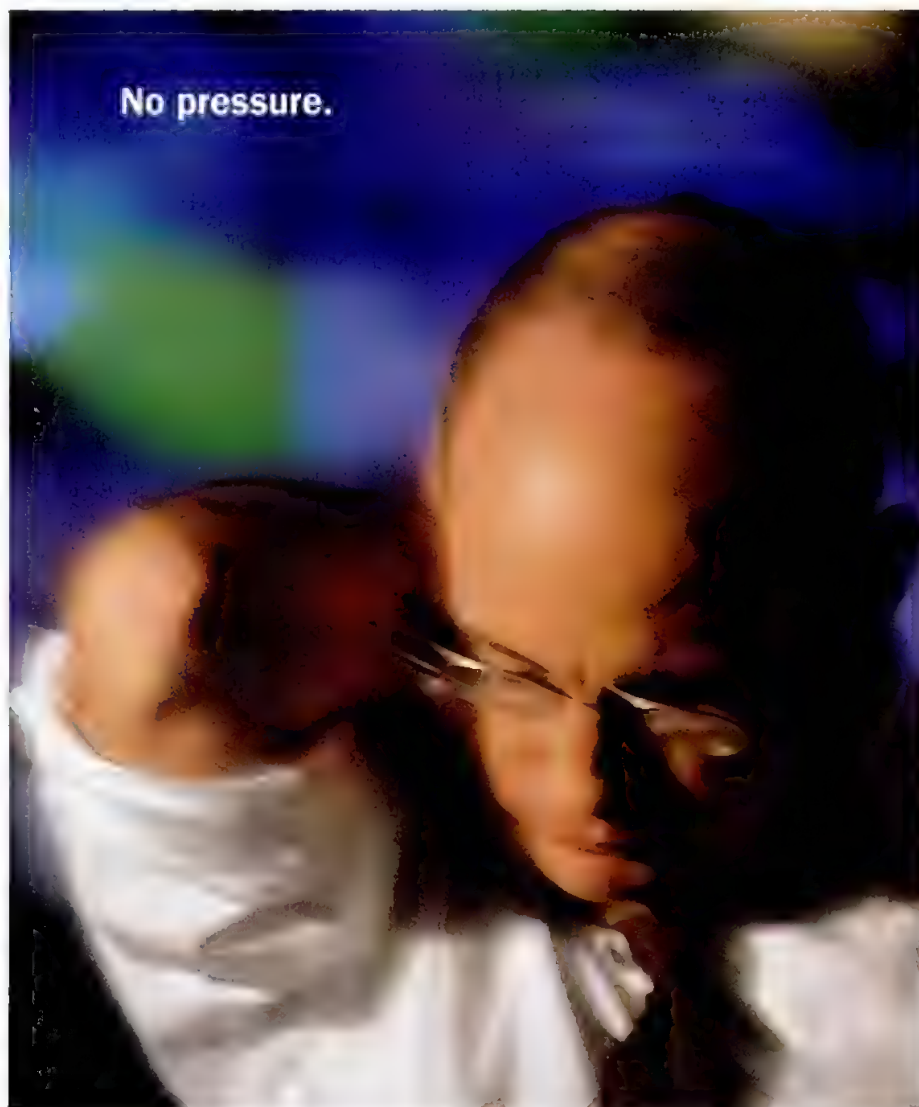


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More Room to Store

The portable Iomega Zip 250 SCSI Drive boosts Zip disk format storage capacity.

By Bruce Brown

Iomega Corp., in an obvious but welcome move that extends its near lock on the removable storage device and media markets, has introduced the Iomega Zip 250 Drive and disks. Available in both SCSI and parallel port external models (we tested the SCSI version) at \$200 street each, the Zip 250 Drive is a natural step up for users who like the portability and universal acceptance of 100MB Zip drives and disks but want to store more data on a single piece of media.

The new Zip 250 Drive is the same size as the original model, and the SCSI version can connect to existing Iomega Zip Zoom SCSI cards (\$50 street). The SCSI version transfers at a maximum rate of 1.7 MBps, compared with 0.3 MBps for the parallel port version. The Zip 250 Drive is backward-compatible with the original 100MB disks: On our tests, the SCSI version successfully read existing data from 100MB Zip disks and saved data on 100MB format disks that were readable on 100MB Zip Drives.

If you have an existing ASPI-compatible SCSI card or a 16-bit slot and an available system IRQ to handle the Zip Zoom card for the SCSI version of the drive, the SCSI device's higher transfer rate makes it a better choice than the parallel port version. The parallel port Zip 250 Drive gives up transfer speed but is easier to move from one PC to another.

Iomega has not announced internal versions of the Zip 250 Drive, but the eventual appearance of internal IDE and SCSI versions seems likely. The original Zip Drive now sells for approximately \$120 (street) in internal and external versions, with the exception of the new USB version, which sells for

\$150 (street). A USB version of the Zip 250 Drive is another logical future development. The new-format disks sell for \$70 (street) per four-pack and \$100 for a six-pack (one 250MB disk is included with the drive).

The Zip 250 Drive is covered by a one-year limited warranty on the drive itself and five



years for the media. The drive is bundled with utility, copy, and backup software, as well as Norton Zip Rescue and the RecordIt voice and music recording application.

By building on its vast user base through offering media compatibility, Iomega has made the Zip 250 Drive the next logical upgrade for removable PC data storage.

Iomega Zip 250 SCSI Drive.

Street price: \$200. Requires: 486-based PC or later, 8MB RAM, 30MB hard disk space, 2X CD-ROM drive, Zip Zoom or ASPI SCSI adapter with 25-pin D-sub connector, Windows 3.x, 95, 98, or NT 3.51 or higher. Iomega Corp., Roy, UT; 800-697-8833; www.iomega.com; 413 at www.pcmag.com/infolink.

MP3 Goes Mobile

Diamond's tiny Rio PMP300 Portable Music Player lets you take MP3 music files on the road.

By Jan Ozer

Despite the fear that MP3 will mean the end of copyright protection, Diamond Multimedia Systems is shipping the Diamond Rio PMP300 Portable Music Player (\$199 list). This pager-size music box stores up to 66 minutes of MP3 music that you can download from the Internet

gradeable to 48MB (\$49.95). Since the Rio has no moving parts, it doesn't skip the way CD players can. The unit works only with MP3 files, and Diamond includes MP3 conversion software and links to Web sites that distribute music in MP3 format.

When you create your own files, the simplest approach is to work from CD-ROM, since the conversion software can digitally extract audio and create 64-, 80-, or 128-Kbps MP3 files in one step. These three rates allow users to choose their optimal mix of quantity and quality.

On our tests, most songs were slightly distorted at the 64-

Kbps encoding rate, though the distortion would be unnoticeable if

you were working out in the gym. At this rate, the Rio's capacity is 66 minutes, compared with 33 minutes at a virtually distortion-free 128 Kbps.

At all rates, it took about two minutes to encode a 3-minute song on a Dell Inspiron Pentium II/266 notebook, so count on about 40 minutes to encode an hour's worth of music. You can, however, queue a CD-ROM to

encode in the background.

Once the files are encoded, you transfer them to the Rio via another program that lets you create and order a play list. Diamond includes all necessary cables and connectors, as well as the required double-A battery and stereo headphones.

The Rio has typical CD player controls, including a four-setting equalizer. You can play the track list in order or at random; an LCD details track number, volume, file encoding rate, and battery life.

During our tests, Rio proved impervious to the most rigorous shaking and played back without interruption. Battery life was 11 hours at full volume, close to the unit's 12-hour rated capacity. Since flash memory is non-volatile, you don't lose your music when you swap batteries.

The Rio isn't for everyone—audiophiles and computer illiterates need not apply. But others will find Rio a hassle-free, flexible way to control their own musical destinies while on the go. **Diamond Rio PMP300 Portable Music Player.** List price: \$199. Requires: 16MB RAM, 20MB hard disk space, Microsoft Windows 95 or 98. Diamond Multimedia Systems Inc., San Jose, California; 800-468-5846, 408-325-7000; www.diamondmm.com; 412 at www.pcmag.com/infolink.



or create from your own music collection. Smaller than a cassette or CD player, the Rio is ideal for music lovers who want to hear their own perfect album side while they're on the road.

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One-Stop Graphics

Across-the-board improvements to Version 6 of Canvas make it a package that can stand alone.

By Jan Ozer

Deneba Software's Canvas—with vector-based photo-illustration, image editing, page layout, presentation, and other features—has often been considered a jack of all trades and master of none. With striking across-the-board improvements, however, Deneba's Canvas 6 (\$375 street) approaches feature parity with leaders in the illustration and image-editing categories. With its elegant interface, Canvas is a compelling alternative to suite-based solutions that require separate illustration and editing programs to perform the same functions.

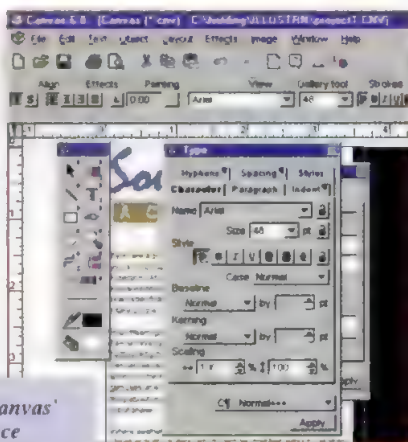
START ME UP

As in previous versions of Canvas, you choose between an illustration, publication, and presentation when creating new projects. Gone, however, is the frustrating limitation that allows illustrations to have layers but only one page, while publications support multiple pages but not layers. Now all projects can support levels and multiple pages, and the only major difference between the project types is menu presets.

Also new is support for both the Kodak Digital Science Color Management System and the International Color Consortium (ICC) standards for color profiles. This long overdue feature promotes fidelity between screen and output colors, facilitating print-based projects.

Canvas' redesigned interface is a model of organization. A small floating toolbar contains all paint, text, path, line, and other tools in reasonably well-organized groupings. You can peel off individual tools into a floating menu, which you can

TOOLBOX: Canvas' new interface organizes all tools into one toolbar with detachable floating menus.



then dock into a tabbed menu on top of the edit window. You can also customize the toolbar and create keyboard shortcuts, thus providing handy access to frequently used operations.

NEW AND VASTLY IMPROVED

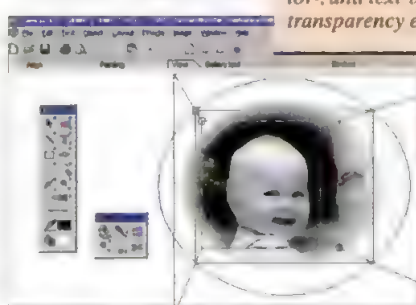
The most significant improvements in this release relate to illustration and image editing, almost as if Deneba's designers assembled a laundry list of past complaints and attacked them one by one. The flashiest new feature is called *SpriteLayer Technology*, which embodies a number of vector- and pixel-based transparency capabilities.

All vector objects, bitmaps, and text can now be made 0 to 100-percent transparent, or you can customize transparency with directional, rectangular, radial, and elliptical blends. You can create a pixel-based channel mask, the equivalent of Photoshop's alpha channel, to edit the transparent area with paint tools. Add new paint tools like marquee and magic wand image selection and over 30 new effects like blur and emboss, and noise, and you've got a feature set approaching that of dedicated image editors and more robust than most other illustration programs.

One important limitation for Photoshop users is the inability to import PSD files and maintain layers. Though Canvas supports layers, the program imports all layers as separate objects on the same layer. And, although you can shift objects to different layers manually, the process is time consuming.

New illustration features include the ability to set gradients over multiple selected objects or text and use a knife tool to cut vector objects. Canvas' illustration toolbox is comparatively modest, though controls are generally easy to find and use. Notable weaknesses include a trace tool that's artistic only and doesn't convert bitmaps to vector objects. Highlights include an extrusion tool that rivals 3-D design programs in flexibility, as well as an envelope control for distorting text and vector objects.

Canvas 6 debuts two



simple ways to bind text to a path or any vector object. You can easily spread text over multiple columns and sections, and Canvas also supports styles and features real-time spell-checking.

Surprisingly, however, Canvas was unable to wrap text around both sides of any object embedded into text. You can work around this to some degree by wrapping multiple columns around the object, but designers who like to embed objects into narrow columns will find themselves frustrated.

TECHNICALLY SUPERIOR

Canvas has always performed well with technical illustrations, featuring extraordinary dimensioning capabilities and numerous precision drawing aids. Canvas 6 adds the ability to create vector objects by numerically specifying coordinates and dimensions; a transform palette lets you size, scale, rotate, and position vector objects with numeric entries.

By contrast, Canvas' Web capabilities are unchanged. You can still animate Canvas illustrations for the Web with Colada, a useful alternative for Canvas designers but not a compelling reason to buy Canvas in the first place. Similarly, though Canvas outputs in GIF, JPEG, and PNG formats, third-party applets generally do a better job and are easier to use. Canvas' Web capabilities are limited, but Deneba probably made a good decision to

ALL CLEAR: New *SpriteLayer Technology* enables a host of pixel-, vector-, and text-based transparency effects.

focus on core functions not well served by such third-party tools.

Dramatic improvements to Canvas' image-editing functions finally make the whole greater than the sum of its parts. Although Canvas probably won't win over many converts among the

Freehand, PageMaker, or Photoshop crowds, the program warrants serious consideration from newcomers seeking an elegant and relatively inexpensive tool for projects involving both vector and bitmapped images.

Canvas 6. Street price: \$375 (\$200 competitive upgrade). Requires: 24MB RAM (32 for Windows NT), 50MB hard disk space, Microsoft Windows 95, 98, or NT 4.0. Deneba Software, Miami; 800-622-6827, 305-596-5644; www.deneba.com; 411 at www.pcmag.com/infolink.



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Boot Up, Turn On, Tune In

These three new devices turn your PC into a shortwave and VHF/UHF scanner.

By Les Freed

No one should be surprised that many of us here at *PC Magazine* are electronics enthusiasts and gadget freaks of one sort or another. After all, finding and reporting on new products—including gadgets—is our mission in life. In the past few months, several manufacturers, including giant Sony Electronics and communications equipment maker ICOM America, have introduced a new breed of radio. These products harness the PC's processing and storage power to make shortwave and VHF/UHF scanning easier, cheaper—and more fun, too.

To survey the PC-controlled radio market, we looked at receivers from ICOM, Sony, and Ten-Tec. The ICOM and Ten-Tec products are "virtual radio" black boxes that connect to your PC's serial port. All radio operations (tuning in stations, setting memories, adjusting the volume, and so on) are done via software provided with the radios. By eliminating all the knobs, buttons, and dials and replacing them with on-screen counterparts, ICOM and Ten-Tec have created radios that provide a level of performance and functionality that would cost nearly twice as much to build into a conventional radio.

The Sony Wavehawk takes a different approach. At first glance, the Wavehawk looks like any other portable VHF/UHF scanner. But a connector on the side of the radio links to your desktop PC or laptop, turning the Wavehawk into a supercharged, computer-controlled scanner. The Wavehawk comes with a CD-ROM database with 3.5 million FCC radio license records, and you can download data from the CD-ROM directly into the Wavehawk's channel

memory. Once you've programmed the Wavehawk, you can disconnect it from the PC and use it as a portable scanner.

WHAT DO THEY DO?

The ICOM and Ten-Tec radios cover the AM and shortwave radio bands, where you can hear standard AM radio broadcasts, international shortwave broadcasts, ham radio operators, long-range military and commercial aircraft and ship communications, marine weather fax broadcasts, and U.S. and Canadian atomic clock broadcasts.

The shortwave broadcasts are particularly interesting, especially for international business travelers. Virtually all national governments operate shortwave broadcast stations. If you have a shortwave radio, you can hear news, sports, and current affairs broadcasts—in English and a host of other languages—from around the world.

The VHF and UHF bands, covered by the ICOM and Sony radios, have a much shorter range than the AM and shortwave bands. They are used for FM radio and TV broadcasting, pagers, utility companies, taxi services, and two-way radio communications, including police, fire, ham, and marine radios—and so on. Cellular phones also use the UHF bands, but cellular monitoring is illegal in the United States, and U.S.-market scanners can't receive the cellular phone bands. Note that many metropolitan police departments have switched to "trunked" radio systems that can't be heard on conventional scanners.

ICOM IC-PCR1000

The ICOM IC-PCR1000 receiver (\$400 street) packs serious power and flexibility into a package about the size of an external modem. Like the Ten-Tec RX-320, the PCR1000 is a black box that requires a PC for operation. Unlike the larger RX-320, the PCR1000 has a built-in speaker and is small enough to fit in a briefcase. It covers a much wider range of frequencies than either the Sony or the Ten-Tec product.

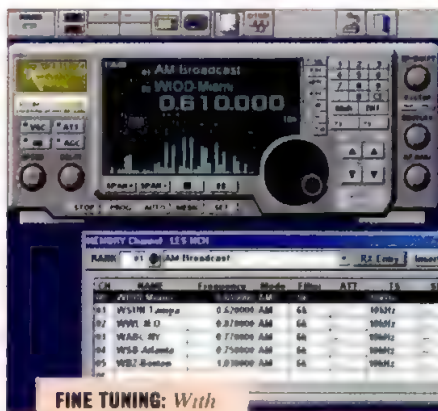
Installing the PCR1000 is a snap; you simply connect the power supply, serial cable, and antenna (all provided) to your PC. The antenna includes 6 feet of shielded cable and a piece of self-stick tape, so you can move the antenna away from your PC (and the radio interference it creates). We stuck our test unit's antenna to the inside of a window and it worked fine. Software installation is equally simple.

The PCR1000's software offers three views of your virtual radio. The Component view (the most elaborate) mimics the controls you might find on a high-

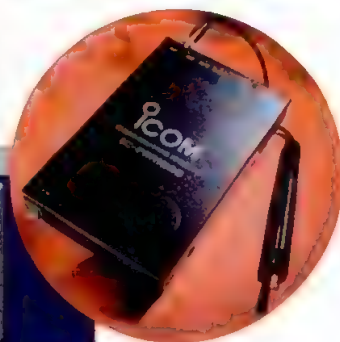
Our only complaint about the software is that it is very mouse-intensive. Some of the virtual knobs and slider controls require precise mouse positioning, which is often difficult to do on a laptop.

The PCR1000 has a complete set of scanning tools to locate and store the frequencies in use in your area. The software's frequency database lets you store 20 banks of 50 channels, each with a detailed alphanumeric identifier—sort of like having a car radio with 1,000 buttons. You can store the frequency database to a disk file and easily create multiple databases containing frequency lists for different cities, different bands, or even different users.

The PCR1000's audio output is clear and strong, but the built-in speaker is too small to do it justice. An external speaker jack lets you connect a speaker, headphones, or line-in connection to your PC for better-quality audio.



FINE TUNING: With the PCR1000, you can store settings for as many stations as you like.



The PCR1000 is a bit pricey, but we liked its small size and extra-wide frequency coverage, especially for portable use. It makes an excellent traveling companion, for those nights when there's nothing to watch on the hotel TV.

ICOM IC-PCR1000. Street price: \$400. ICOM America, Bellevue, WA; 425-454-8155; www.icomamerica.com; 408 at www.pcmag.com/infolink.

SONY WAVEHAWK

The Sony Wavehawk VHF/UHF scanning receiver (\$350

end commercial or military shortwave receiver.

The Communications Receiver view presents the on-screen controls and display as they might appear on a table-top communications receiver, and the Radio view shows a bare-bones view of the frequency display and a few essential controls.



WIDE RANGE: With the Wavehawk, you can scan 20 pre-defined frequency bands.



street) is a hand-held radio about the size of a cellular phone. The radio's front panel has a large, easy-to-read, backlit LCD, a host of buttons, and a small but loud speaker. The Wavehawk operates on four double-A batteries or on AC power using the supplied adapter. Sony includes a removable "rubber duck" antenna with the radio, and you can attach an external antenna via a BNC connector.

Out of the box, the Wavehawk looks and works just like any other VHF/UHF scanner. It has 300 internal memories, so you can store up to 30 channels in each of 10 memory banks. But it's the PC connection that makes the Wavehawk different. The provided serial cable and CD-ROM turn the Wavehawk into a super scanner.

The included CD-ROM contains the Wavehawk's PC software and the 3.5 million-record database containing FCC license data for the entire United States. You can search the database by city, county, state, licensee name, frequency, or service type (police, fire, and so on).

More important, you can easily transfer the search results directly into the scanner. This saves hours of programming time and gives you a head start on locating the active channels in your area. Once you've programmed the scanner, you can save the memory contents into a file on your PC. Travelers can save multiple memory files, making it easy to reprogram the scanner for different cities.

The Wavehawk software provides PC control of all the Wave-

hawk's functions, including scanning, tuning, and memory storage and retrieval. A toolbar along the top of the screen has buttons that provide quick access to frequently used functions.

The Wavehawk's portability and programmability will make it a hit with scanner enthusiasts, reporters, and other users who want to keep tabs on local two-way communications.

Sony Wavehawk. Street price: \$350. Sony Electronics Inc., Park Ridge, NJ; 800-222-7669; www.sony.com; 409 at www.pcmag.com/infolink.

TEN-TEC RX-320 PC RADIO

The Ten-Tec RX-320 PC Radio (\$295 direct) is a high-quality AM and shortwave receiver in a black box. The RX-320 doesn't cover the VHF and UHF bands, as the IC-PCR1000 does, but it equals the PCR1000's performance in the AM broadcast and shortwave bands—for a little less than three quarters of the price. The RX-320 is nearly twice the size of the PCR1000, though, making it less suitable for portable use.

The RX-320's rear panel provides connections for power, audio output, and an antenna jack. A 9-pin serial connector

hooks up to a serial port on your PC via the provided cable. A telescoping antenna attaches to the top of the radio, and Ten-Tec recommends keeping the antenna as far away from your PC as possible. The user's manual explains how to connect an outside antenna, and it also contains an excellent general introduction to shortwave radio.

Ten-Tec's software installs from a single floppy disk in only a minute and is less elaborate but easier to use than PCR1000's. A toolbar at the top of the screen provides access to commonly used functions.

The virtual radio interface mimics a communications receiver, complete with a digital clock showing local and world times, a signal strength meter, buttons for tuning step size and reception mode, and a large tuning knob in the center of the radio.

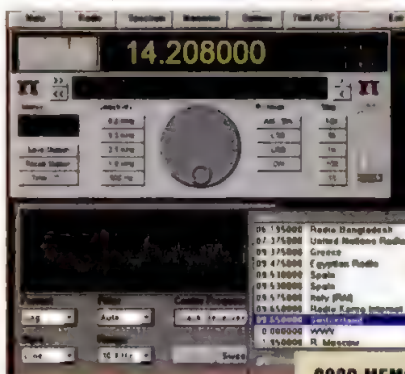
You tune the radio by clicking on the knob or by clicking either of two sets of up/down buttons. One set of buttons provides fast tuning for locating stations quickly, and the other provides a

Station button. A toolbar button provides quick access to the database, and radio buttons in the database window let you sort the entries by station name, frequency, or country.

Our sample RX-320 performed well—once we placed the unit near a window. The telescoping antenna simply couldn't receive stations over the high interference level in a computer-filled home office. Connecting an outside antenna really brought the RX-320 to life, pulling in stations from around the world.

We were impressed with the RX-320's performance, especially when picking through closely packed signals in the crowded AM radio and shortwave bands. For example, we were able to listen to a football game on an AM station 200 miles away on 610 KHz, even though there's a strong local station on 620 KHz.

The RX-320 is a lot of radio for

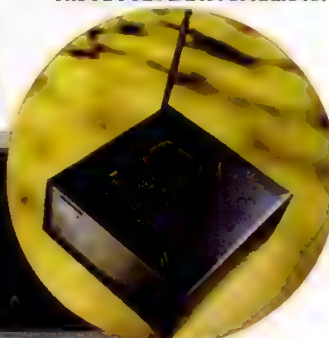


GOOD MEMORY: The RX-320's band scope display provides a quick view of stations.

fine-tuning adjustment.

The radio can also be tuned from the keyboard using the Up and Down Arrow keys. If you know the frequency of the station you want, you can simply enter the numbers on the keyboard and press Enter.

Ten-Tec includes a small sample database of shortwave stations with the RX-320, and you can easily add entries via a Save



the money, providing performance and features that would cost \$1,000 or more in a conventional radio receiver. As a bonus, Ten-Tec provides free

and complete documentation of the RX-320 interface protocol, along with a sample Visual Basic program for users who want to write their own custom software.

Ten-Tec RX-320 PC Radio. Direct price: \$295. Ten-Tec Inc., Sevierville, TN; 423-428-0364; www.tentec.com; 410 at www.pcmag.com/infolink.



With the new printers installed, the IS Manager notices a slight shift in status.

Introducing the HP LaserJet 8100, our newest monochrome printer. Along with HP reliability, this departmental printer offers a number of ways to control how and when documents are printed. It lets you make additional printouts right from the printer control panel, allows for private printing of confidential documents, and does all of this at up to a 32 ppm print speed. Visit www.hp.com/go/newprinters to learn more about our hassle-free network printers.



Tweaking Windows 98

These utilities from O'Reilly solve some Windows 98 annoyances but have their own problems.

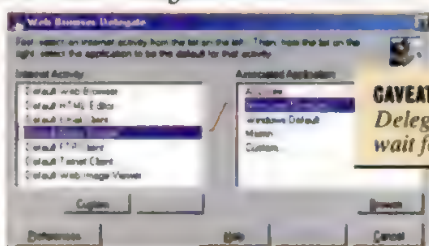
By Edward Mendelson

Some users may be satisfied with the way Microsoft Windows 98 looks and feels when it's first installed, but we haven't met them. O'Reilly Utilities for Windows 98 Annoyances (\$39.95 list) from O'Reilly & Associates is a set of programs that customize hard-to-find Windows 98 settings and add conveniences that Microsoft left out.

Many features can be found elsewhere, though, and this version suffers from rough edges and system-damaging bugs. The package supports Windows 98, but some features are usable on Windows 95 and NT 4.0.

O'Reilly Utilities for Windows 98 Annoyances comprises five utilities and a comprehensive help file. Two utilities are designed to ease Internet software headaches. One, a manager for browser bookmarks, displays Netscape and Internet Explorer favorites in side-by-side panes; you switch formats simply by dragging icons between the panes.

The other, Web Browser Delegate, is the component with the most serious bugs. Don't even



CAVEAT: Web Browser Delegate is full of bugs; wait for the fix.

think of using this appallingly understated utility until a fix is available. If you tell it to restore the default Windows Telnet or FTP clients, all Telnet or FTP links in your browser stop working.

There are two file-related utilities. One renames multiple files in a single operation. The other displays file version information (as Explorer does when you press Alt-Enter on a filename) but also finds files for you in the DOS path so you don't have to search through Explorer windows.

Solutions, the most elaborate utility, offers dozens of changes in the Windows 98 registry to improve performance, hide desktop and Start menu items, and tweak the user interface to make menus open faster. With this utility, you can add commands to Explorer right-click menus that let you copy filenames or file contents to the clipboard, open a DOS

prompt, and perform other tricks.

If you add the command that supposedly compares the contents of folders, though, you get a message that says the feature is not yet implemented. An O'Reilly representative was astonished when we reported this problem and promised to post a bug fix on the vendor's Web site.

All the programs are weak in keyboard support. Windows keystrokes are ignored, and the bookmark management utility can't be run from the keyboard at all. O'Reilly acknowledges these problems and promises to post a free upgrade on its Web site. Even so, the package is flexible and powerful enough to consider even before the fixes arrive. **O'Reilly Utilities for Windows 98 Annoyances.** List price: \$39.95. Requires: 16MB RAM (32MB recommended), 6MB hard disk space, Windows 98. O'Reilly & Associates, Sebastopol, CA; 800-998-9938; www.oreilly.com; 404 at www.pcmag.com/infolink.

Scanning sans PC

The ImageDeck from Microtek is easy to set up and use, but don't expect amazing results.

By Daniel Grotta and Sally Wiener Grotta

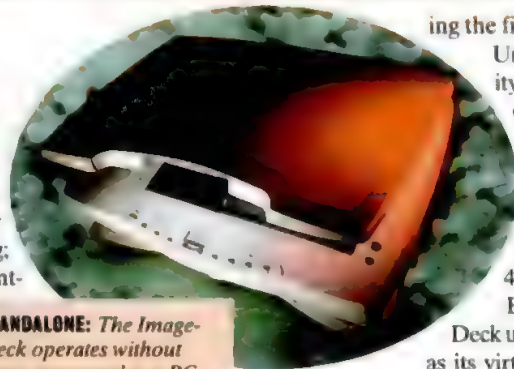
Because it doesn't require a PC—indeed, you cannot attach it to a PC—the Microtek ImageDeck (\$500 street), a 30-bit, 600- by 600-ppi color scanner, is described as a standalone scanning appliance. It saves scanned images in JPEG format and text in PCX format to its built-in Zip Drive or floppy disk drive and can double as a color copier. Although computer-free scanning may appeal to PC-phobes, the ImageDeck's performance and scan quality are disappointing.

Plug in the ImageDeck and it's almost ready to scan. But it requires either a floppy disk or a Zip cartridge—neither of which is furnished—to operate. A floppy disk will do for many tasks, but you'll need a Zip cartridge to

achieve higher-quality scans. The package does include PhotoImpact, for postscan image editing; PageKeeper, a document-management program; and OmniPage LE, for OCR.

You can specify the scan or copy function; the number of copies or scans; black-and-white, color, grayscale, or text mode, as well as three resolution and three compression levels (or a specific resolution number). An LED reports status and error messages, but the skimpy documentation does not explain what all the error messages mean.

The ImageDeck can output directly to a parallel printer, and a PC printer can be connected via its pass-through port. The scanner supports only 48 types



STANDALONE: The ImageDeck operates without being connected to a PC.

of printers; some are oddball or obsolete models. Also missing are generic drivers. Microtek says that when you select a printer, it remains the default device, but each time we changed from copy to scan mode or turned the unit off and on, the default switched back to the HP DeskJet.

Operating the ImageDeck is simple; it can even format the cartridge or disk. Scans automatically save to the selected storage medium; we had no difficulty opening and read-

ing the files with any PC.

Unfortunately, scan quality is subpar, with muddy colors, darkened mid-tones, and indistinct details. The scanner is also slow; a 4.5- by 6.5-inch photo set at 300 ppi took 1 minute 49 seconds to scan.

Because the ImageDeck uses the cartridge or disk as its virtual memory buffer, it took over 14 minutes to copy and print our test photo. And the ImageDeck cannot be used for another job until printing is complete, so it's virtually useless for high-volume traffic.

The ImageDeck's slow performance, inferior image quality, and high price more than offset its ease of use. For simplicity, look at one-touch units from HP, Visioneer, and others.

Microtek ImageDeck. Street price: \$500. Microtek Lab Inc., Redondo Beach, CA; 800-654-4160, 310-297-5000; www.microtekusa.com; 405 at www.pcmag.com/infolink.



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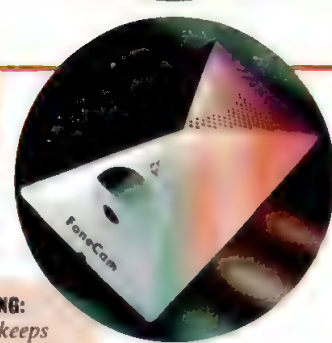
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Remote Vision

Moonlight's FoneCam lets you send real-time still images from remote locations via a phone line.

By Bruce Brown

Need to keep your eye on things in a place with no personnel and no PC? The FoneCam (\$300 street) from Moonlight Products may be the answer. It's a combination digital-color still-image camera and 14.4-Kbps modem.

You can set the FoneCam up anywhere that has a phone line and a power supply. It captures

images on demand or at scheduled times, then transmits them to a computer. You can maintain dynamic Web sites and monitor your office or home.

The 10.6-ounce FoneCam is larger than most stationary digital cameras, at 3.5 by 3.6 by 6.3 inches (HWD). A red light glows continuously when the device is on and blinks when an image is captured. On the bottom is a

swiveling pedestal mount.

The FoneCam's camera is based on a 320- by 240-pixel CCD image sensor. It uses a 3.6-mm, f2.0 lens with a wide viewing range and a focal range of 6 cm to infinity. The camera captures images in BMP, JPEG, PNG, and TIFF formats. Image file sizes range from 3K to 50K. You can shoot in daylight and illuminated night environments; the image quality of an indoor shot we took was high.

I'M WATCHING:

FoneCam keeps an eye on things when you can't be there.

The FoneCam connects either directly or remotely to your

computer, using a serial cable for direct connection or the camera's modem via a standard phone line. A 14-foot phone cable, RJ-11-to-DB-9 serial adapter, RJ-11 two-way splitter, and AC adapter are included. Installation took 10 minutes.

The included FoneCam Control software remotely controls modem and security settings, scheduling, image log, image size, quality, and color selections. Images can be saved, printed, and viewed individually, as thumbnails, and as time-lapse images in an animated sequence.

You connect to a remote FoneCam by dialing its number on a telephone line. You can also access public FoneCams, such as one overlooking San Diego Bay; some require viewing passwords. The FoneCam software for image viewing is a free download from the company's Web site (www.fonecam.com).

The FoneCam's software bundle includes PY Software's Animated Screen, Edge Publishing's File Dog, and Jasc Software's Paint Shop Pro with Animation Shop. Accessories include supplemental cameras called ExtensionCams (\$300 street), outdoor enclosures, and mounting devices.

The FoneCam is easy to install and operate, and it provides many options for image capture, viewing, and manipulation. Users will continually find new applications for the FoneCam. **Moonlight FoneCam.** Street price: \$300. Requires: 4MB RAM (8MB recommended), 10MB hard disk space, modem, Microsoft Windows 95, 98, or NT 4.0 or later. Moonlight Products, San Diego; 619-625-0300; www.fonecam.com; 401 at www.pcmag.com/infolink.

Paint Your Web Site

MetaCreations' new Painter 5.5 concentrates its distinctive strengths on Web image editing.

By Daniel Grotta and Sally Wiener Grotta

Web graphics are big, so it's no surprise that the new version of MetaCreations' Painter focuses on the Web. The added features may be reason

enough to upgrade to Painter 5.5 Web Edition (\$300 street). To help decrease download and upload times, Painter's Image Slicer feature cuts a picture up into segments, or slices. Each slice may be assigned individual attributes,

including compression, optimization, and JavaScript rollover states. You can save the slice as a GIF, JPEG, or TIFF file, and a table for reassembling the image is saved in HTML.

Slicing in Painter is relatively logical. But defining JavaScript rollovers is time consuming. The floater (objects) palette isn't accessible from the Image Slicer dialog, so each time you define a state, you must close the Image Slicer dialog, move your objects, then return to the Image Slicer to export that state to the HTML file.

Another plug-in floater is the Dynamic Text tool, which lets the user reedit text. As you type and edit in the dialog, the text displays in your picture. You can control leading, tracking, opacity, blur, motion, rotation, slant, size, and stretch, but you can't

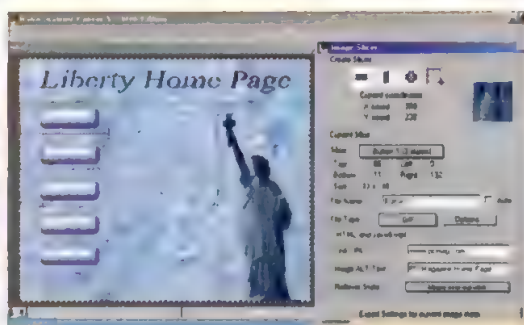
users define any object as a clickable URL link. Now, in addition to its previous server-side maps, Painter offers client-side image mapping.

The CD contains about 1,000 new Web-size objects with transparency channels. Instead of a standard clip art library, each grouping of objects in the clip art library is in a document that you must open; you then drag and drop the one you want from the master document to your page or painting—a cumbersome procedure.

Painter 5.5 Web Edition is a minor upgrade, but the Image Slicer, client-side maps, and Dynamic Text tool are

are well-implemented improvements. If you are using Painter images for the Web, you might find this upgrade useful; traditional artists who use text will find it invaluable. Others would probably do just as well waiting for next year's Version 6.0.

Painter 5.5 Web Edition. Street price: \$300; upgrade for Painter 5 users, \$79; upgrade for users of Painter 4 or earlier, \$129. MetaCreations Corp., Carpinteria, CA; 805-566-6200; www.metacreations.com; 400 at www.pcmag.com/infolink.



FAST SLICES: Image Slicer lets you assign attributes to segments of a page, lessening upload and download time.

input precise values for the sliders.

The only drawback of this powerful feature is that you can have only one plug-in attached to an object at a time. If you apply another effect, the text will no longer be editable.

Natural media brushes have always been Painter's hallmark. New with this version is a large variety of calligraphic brushes. The new Web brushes offer Internet-safe, low-bandwidth variations of popular brushes.

Painter's image mapping lets



Nokia 446Xs



OUR ENGINEERS WERE GOING FOR A LINE-OF-SIGHT 35° BELOW EYE LEVEL.



OUR DESIGNERS WERE GOING FOR *swoopy*.

Despite their differences, vocabulary being the most obvious, the engineers and designers at Nokia are all focused on the same thing. Namely, to build the world's best monitors.

It's this unique collaboration that makes every Nokia a marvel of technology and ergonomics, as well as contemporary Finnish design.

The Nokia 446Xs is a perfect example. This sleek 19" monitor (17.8" VIS) delivers up to 1600 x 1200 resolution, up to 90Hz refresh rate at 1280 x 1024, with a .22mm horizontal dot pitch. It's a short neck CRT for a smaller footprint, but it saves considerably more than desk space.

Research shows that traditional viewing angles require your eyelids to be more open, allowing moisture to evaporate, causing dry eye and fatigue. We corrected this problem by designing the Nokia 446Xs with a lower base, allowing for an optimum viewing angle of 35° (similar to the angle at which you're reading this magazine). The monitor's lower profile helps users experience less fatigue, not only in their eyes, but also in their neck and back.

It's a monitor of optimum ergonomics. With radically hip overtones, of course. For more details, call 1-800-BY NOKIA, or visit us at www.nokia.com/americas.

NOKIA
CONNECTING PEOPLE

The Truly Worldwide Web

L&H introduces a translation service that can help more people interpret the Internet.

By Greg Alwang

Since an estimated 80 percent of Internet content is in English, the new iTranslator Professional Service from Lernout & Hauspie Speech Products (L&H) is a boon for non-English-speaking Internet users. You can translate documents, do multilingual searches, and manage the results.

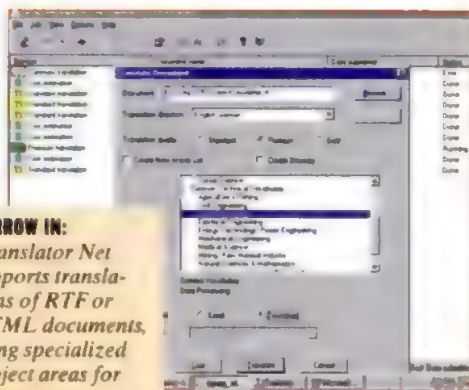
iTranslator's Search component currently supports multilingual searches and Webpage-summary translations between English and French, German, or Spanish. The Net component translates RTF and HTML documents and adds Arabic, Japanese, Korean, Italian, and Portuguese to the supported languages.

Improving on tedious traditional multilingual searches,

iTranslator lets you issue multilingual metasearches from a central location and compile results from various search engines in one list. Site summaries are automatically translated, letting users assess search hits' relevancy.

You narrow a search by selecting a subject, such as Technology, Medical Science, or Economy and Trade. Subjects are configured to access specified search engines and 35 specialized sites, such as CNNfn or ZDNet.

Each search initially goes to L&H's Machine Translation Server, which converts the keywords into the supported languages and passes the search to the specified search engines. On our tests,



NARROW IN:
iTranslator Net supports translations of RTF or HTML documents, using specialized subject areas for better accuracy.

we searched for "ceramic tile" in Spanish and received a list of 76 matching sites; all site summaries were translated to Spanish in minutes.

Any Web page referenced in the results list can be translated. An HTML page is returned with the translated language in the top frame and the original language in the bottom. iTranslator lets you delete or add URLs to the results list and recall any past search.

iTranslator's three translation

options range in price and accuracy. Machine translation is included with the cost of the service and is sufficient for less formal, internal correspondence.

A postediting option includes a human edit of the machine-translated version and costs extra, depending on the length and subject. For sensitive cor-

respondence and legal or marketing materials, a complete human translation option costs about double the postediting option. You can request cost estimates before submitting any document for translation.

L&H iTranslator Professional Service. Price: \$49.99 per month (includes 2,000 site summary translations and 10,000 word translations). Lernout & Hauspie Speech Products, Burlington, MA; 781-203-5000; www.lhs.com; 402 at www.pcmag.com/infolink.

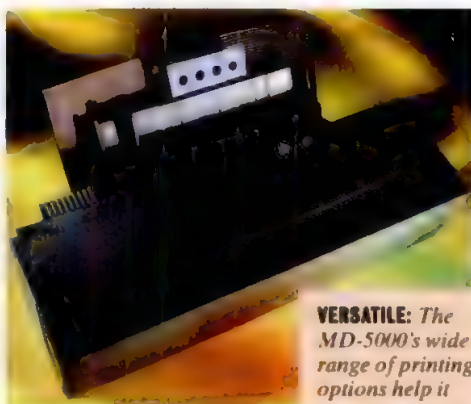
Print in Living Color

This new color printer from ALPS isn't a speed demon, but it produces top-quality color prints.

By Daniel Grotta and Sally Wiener Grotta

The ALPS MD-5000 (\$599 list) is, at first glance, a near-perfect, all-purpose desktop color printer. It can output true continuous-tone images, near-photo-quality prints, snazzy metallic spot colors, and great-looking text, and the cost of consumables is comparable with most ink jets. But the unit is significantly slower and somewhat pricier than photo-quality ink jet printers.

The MD-5000 can accommodate up to seven ribbon ink cartridges, which are automatically swapped in and out of the print head. This lets you mix standard colors, spot colors, gold and silver metallic ribbons for embossing, dye sublimation ribbons, and so



VERSATILE: The MD-5000's wide range of printing options help it rival color ink jets.

on. The most practical combination is ALPS' six-ribbon set of Micro Dry color ribbons, with CMYK colors and Vphoto Primer, an undercoat for protecting the printed image.

Setup and installation are routine and operation is trouble-free as long as you set your parameters properly. Depending on

which ribbon sets are being used, the MD-5000 makes anywhere from one pass (monochrome) to six passes (CMYK with undercoat and overcoat).

When we tried the printer, one double-spaced page of text took 50.1 seconds to print; the same page took 59.2 seconds on an Epson Stylus Photo 700. But a 17.1MB TIFF file that needed only 2 minutes

56 seconds to output on the Epson printer took 5 minutes 56 seconds to print on the MD-5000.

The MD-5000 works best with hard-surface laser paper. The ink is embossed rather than sprayed, so it adheres to the paper's surface instead of sinking into the fiber. This ensures that prints are waterproof, smearproof, and fadeproof. For higher print quality and better

colors, selecting the primer undercoat transforms ordinary copy paper into glossy paper.

We were impressed with the image quality of our test prints. Colors are rich yet subtle, and there is a wealth of detail usually seen only in a glossy print. Depending on the inks and paper you use, the MD-5000 can print at a resolution of up to 2,400 dpi, with a variable dot pitch. The text isn't as dark as ink jet output, but it's as sharp or sharper than a high-resolution laser printer.

The MD-5000 is more expensive and prints more slowly than a comparable photo-quality ink jet, but it is much more versatile; and it's capable of producing better-looking output without requiring glossy paper.

ALPS MD-5000. List price: \$599. Requires: 16MB RAM (32MB recommended), 40MB hard disk space, Windows 3.1 or later. ALPS Electric USA Inc., San Jose, CA; 800-825-2577; www.alpsusa.com; 403 at www.pcmag.com/infolink.



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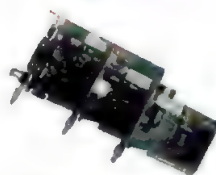


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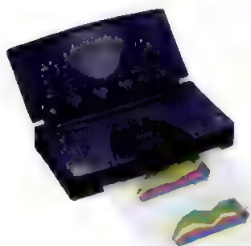
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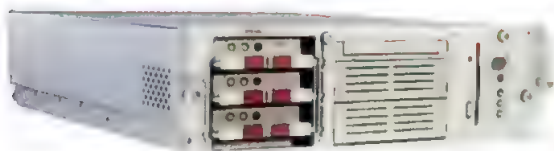
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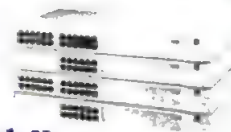
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Now Presenting...

LMSoft Presenter 3.0 successfully demystifies a traditionally challenging task.

By Stephen W. Plain

With LMSoft Presenter 3.0, LMSoft delivers a tool that puts professional-looking multimedia applications within reach of almost any user. Priced at \$79 (list), this version has 32-bit architecture for Windows 95, 98, and NT use, and adds more templates and Internet connectivity.

Like most presentation packages, LMSoft Presenter builds publications that consist of layered pages. Unlike some, this program doesn't burden you with an overbearing user interface. Instead, LMSoft presenter employs a series of manageable dialog boxes that let you modify the object you're working with.

Even the basic program toolbox is minimal, offering editing options and the six basic objects (buttons, images, links, movies, sounds, and text) in a floating window. LMSoft Presenter speeds the initial creation process with dozens of publication templates that offer a choice of appearance, page-link structures, and target display modes.

With LMSoft Presenter, you can link any object in your publication to other pages, programs, or URLs. Thirty-four transition effects are available for presenting each option and page in your publication.

In this version of the program, Internet use is enhanced. LMSoft sees Presenter publications as interactive applications that navigate and retrieve elements on the hard disk, CD-ROM, and the Internet. You can place URLs in your publication for real-time retrieval while the program is running or simply import graphics and multimedia from the Internet. The opening screen also includes a link to an LMSoft-maintained Web page of pointers to reposi-

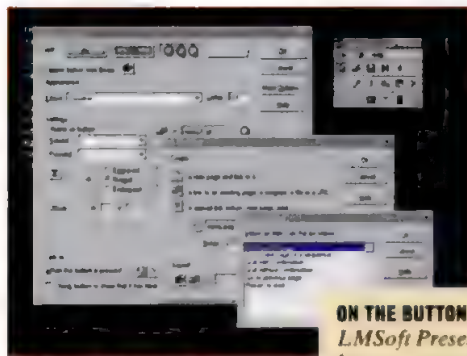
tories of sample elements online.

Another Internet feature is the ability to distribute your publication to the Web. This requires only a small program called the publication engine, to run the publication through an Internet connection.

You can also distribute your publications to disk or CD-ROM and create executable versions that do not require LMSoft Presenter to run. To address the hassle of contending with target-system display capa-

bilities, the program lets you define different background images for VGA, Super-VGA and XGA resolutions.

LMSoft Presenter offers a cost-effective and easy way to create and distribute first-rate multimedia presentations. The only noticeable omission is the



ON THE BUTTON:
LMSoft Presenter lets you create multi-state buttons with different images.

ability to access data files or databases, which would let your presentations access dynamic data. Nevertheless, whether you're building a stunning multimedia presentation for your company or a self-running CD-ROM of your favorite digital photos, this program is friendly and helpful.

LMSoft Presenter 3.0. List price: \$79. Requires: 8MB

RAM, Windows 3.1 or 95, CD-ROM drive, VGA video card, 8-bit sound card (16-bit recommended). LMSoft Inc., Montreal; 514-948-1000, ext. 232; www.lmsoft.com; 406 at www.pcmag.com/infolink.

Serious Statistics

Systat 8.0 has right-click menus, an Explorer-like interface, and a 32-bit architecture.

By Barry Simon

SPSS has consolidated its standing in the statistical world with purchases over the past few years of competitors Systat, Sigma Stat, and BMDP. One result is the placement of Systat (\$1,000 street) as its flagship product for

"browser window." It is actually more like Windows Explorer than a Web browser.

On the left of the window is a list of procedures and graphs in an outline form, under the files used to produce them. To the right is an output pane showing the graphs and numeric output

associated with the item selected in the left pane. And below is the Systat command line and a log of commands run.

You can now modify the textual output as with a word processor, rearranging output by dragging and dropping it, and docking or detaching toolbars. The data editor is linked to the graphs: Choosing data points in the graph highlights the data in the data editor, for example.

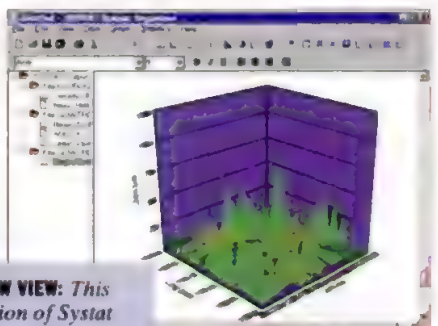
Some customization of the graphs that appear in the output pane can be done via right-click menus and a toolbar. Alas, the

interface for changing graphs falls short of the best technical graphing packages, led by SPSS's own SigmaPlot. We'd prefer a single multitabbed dialog to handle all aspects of the graph customization.

Other shortcomings include Systat's inability to customize toolbars and undo most operations. Also, some of the graphical actions aren't in the menus; if you hide a toolbar, you may miss some features.

The chief new feature of the underlying engine is spatial statistics, including the ability to import ArcView map and data files. Added to this is a large library of statistical procedures carried over from earlier versions, which dwarfs that of any other major product.

The new interface is an improvement over the prior version. Current users will want to upgrade, and serious researchers will want Systat 8.0 for its vast collection of procedures. **Systat 8.0.** Street price: \$1,000. Requires: Windows 95, 98, or NT 4.0, 16MB RAM, 25MB hard disk space. SPSS Inc., Chicago; 800-543-2185; www.spss.com; 407 at www.pcmag.com/infolink.



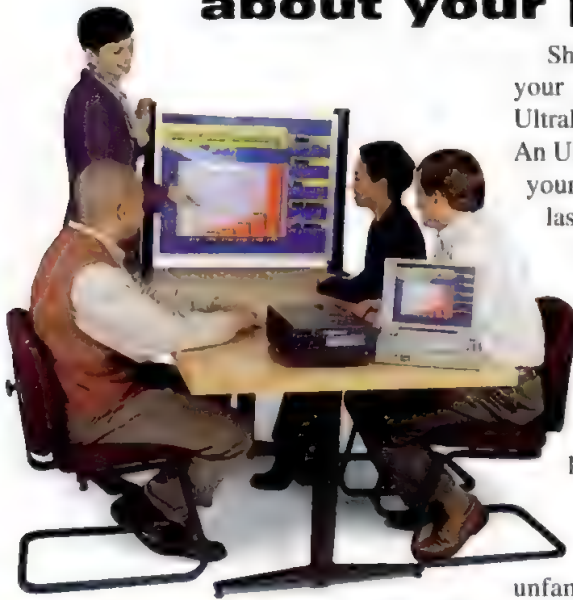
A NEW VIEW: This version of Systat 8.0 lets you view geographically linked data.

researchers doing science, social science, or statistics, in academic or commercial labs.

The new version of Systat shifts to a 32-bit architecture and adds a modern interface to its base of statistical procedures. The cockpit of Version 8.0 is the

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Sun Ups the Ante

Solaris 7.0's new management tools and improved integration are ready to take on the competition.

By O. Ryan Tabibian

Sun Microsystems' Solaris is the dominant platform for hosting Web applications. But Microsoft Windows NT, with a strong foothold in the corporate workgroup, has recently threatened that position. Sun's response to the competition is Solaris 7.0 (5 users, \$695 list), an already scalable and high-performance operating environment with new usability and integration features that should be appealing for both the workgroup and Internet server platforms.

High on the list of new features is a 64-bit kernel that provides higher capacity for memory and I/O, along with better general server performance. The 64-bit environment, which is backward-compatible with existing 32-bit applications, is currently available only with the SPARC version of Solaris 7.0. (The Intel version will be ready when the vendor ships its 64-bit processor, code-named Merced, by mid 2000.)

WIZARDS TO THE RESCUE

"Ease of use" is a phrase not normally associated with Unix operating systems. With Solaris 7.0, however, Sun is helping to change that. The new version of Web Start, a browser-based installation utility using the Sun Hot Java browser, makes installing and configuring Solaris 7.0 on SPARC systems a snap. And thanks to a partnership with Install-Shield, wizards now guide the installation of all Sun software.

During our tests, we chose the default installation method, and after answering a few simple questions (such as server name and IP address), the

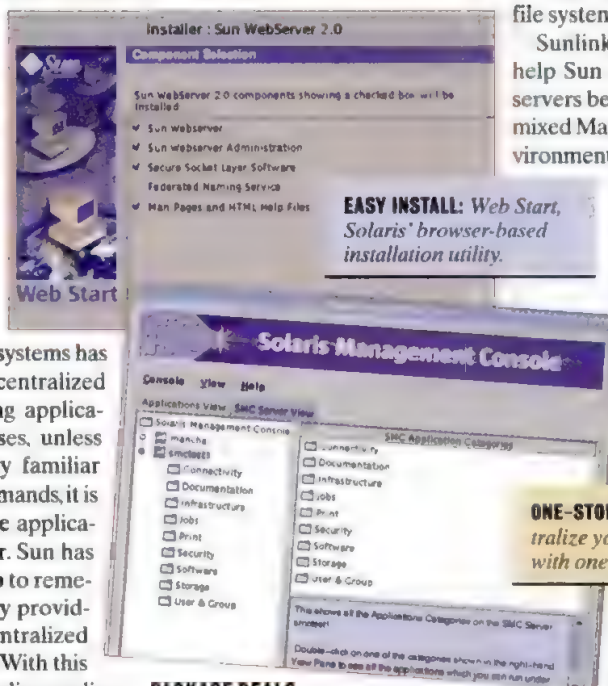
process took over and completed the installation of the OS and our selected applications. This process was painless and took less than an hour to complete on our SPARC Ultra/2 workstation.

INTEGRATED MANAGEMENT

Another complaint about Unix systems has been the lack of centralized tools for managing applications on the server. Sun has taken the first step to remedy this situation by providing a graphical, centralized management tool. With this tool, you can centralize applications within the console and simply double-click on the application to launch the management console.

Unfortunately, on our tests, this process proved cumbersome. We attempted to create a pointer in the console to manage the Web

server but found ourselves heavily referring to Sun's online documentation (www.docs.sun.com) to configure the console. In addition, we had to revert to the command line to configure the Web server fully.



PACKAGE DEALS

To target the product more effectively, Sun is marketing Solaris 7.0 with three different add-on packages: Solaris Easy Access Server 2.0 (SEAS, formerly Solaris for Intranets), Solaris Enterprise Server 1.0, and Solaris ISP Server 2.0. For this review, we tested SEAS; the other two servers aren't currently shipping.

The most impressive

FILL IT OUT: Installation is as simple as answering a few questions.



tools within SEAS are Solstice DiskSuite and Sunlink PC 2.0 (formerly TotalNET). Solstice DiskSuite is a disk-and-volume management tool that, on our tests, made disk management effortless.

DiskSuite still uses the Unix File System

(UFS). A popular alternative is the Veritas File System (VxFS), from Veritas Software Corp., as it eliminates a number of UFS limitations. VxFS also offers better recovery from crashes, as well as quicker restore of the file system than UFS.

Sunlink PC 2.0 should help Sun workstations and servers better integrate into mixed Macintosh and PC environments. Using PC 2.0 on

Sun workstations or servers can make them act as file and print servers for both PC and Macintosh clients. PC 2.0 also supports a variety of protocols such as Apple-

Talk and IPX. SunScreen SKIP, software that encrypts any

network transmission between two Solaris units, is also included with this package.

If you need documentation, Sun has finally moved most of its documentation to the Answerbook format, which is fully searchable. Using the Answerbook application, users can perform full text searches of all Sun documentation online.

Users who are looking for GUI-type management may be a little frustrated with the command line interface (bundled X-Windows tools do include Open Windows or Common Desktop Environment), but the addition of new management tools and better integration is a welcome improvement over the previous versions of this product.

Solaris 7.0. List price: 5 users, \$695. Sun Microsystems Inc., Palo Alto, CA; 800-786-3463; www.sun.com; 912 at www.pcmag.com/infolink.

Peace for Unix and NT?

Microsoft has finally added Unix integration to its core operating system.

By Steve Rigney

Within organizations, you'll find single LANs running Windows NT, NetWare, and different flavors of Unix. In an effort to make network administrators' lives easier, Microsoft has introduced Windows NT Services for Unix (\$149 list). This NT add-on product is really a group of three applications: a telnet client and server, an NFS (Network File System) client and server, and a Unix shell. There is also a password synchronization utility. All of these features are available in other third-party products and in fact are very similar to Intergraph's AccessNFS package, which Microsoft licensed.

Perhaps the most useful of the many tools is the NFS client and server utility bundle. You can use

this application to share NT volumes with Unix clients and to connect to a Unix volume running NFS (but only from an NT-based PC). Windows NT has always had a telnet client utility, but it was Windows-based and not capable of running any of the remote admin utilities. NT Services for Unix's telnet client, however, is character-based and capable of displaying any terminal characters, as well as mapping keys for different terminal types. A new telnet server is also included, and we found it easy to set up and use for remotely administering our NT servers.

Several other third-party NFS and telnet utilities are available for NT, but the bundled Unix

shell included in NT Services for Unix is unusual. With the Korn shell we were able to run Unix-based scripts and commands directly on the NT server. The shell comes with all the commands you need to search, create, and edit files. It even includes a Perl compiler so that users can create their own scripts.

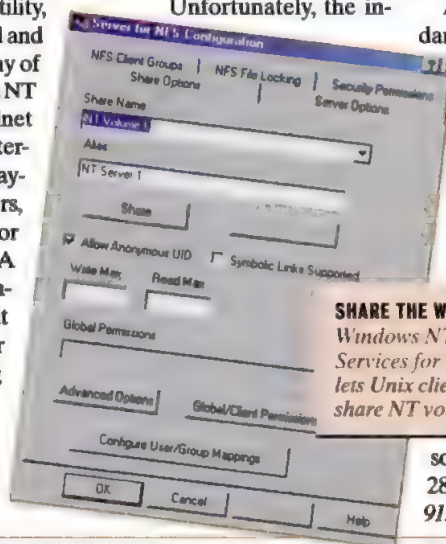
Unfortunately, the in-

cluded password synchronization utility works only one way—from NT to Unix. For example, in testing we were able to send NT user names and passwords to our Unix host but not visa versa. This means you'll have to continue using Unix to define your users, and you can't rely on NT domains.

Although there is an abundance of features, some things are missing, such as an X-Windows client and server, more Unix shells, and more Unix command line utilities. Even without this wish list, however, NT Services for Unix is a good starting point for integrating your NT-based PCs into a Unix environment.

Windows NT Services for Unix. List price: \$149. Micro-

soft Corp., Redmond, WA; 800-285-7772; www.microsoft.com; 913 at www.pcmag.com/infolink.



Warp-Speed Wireless

The Wave Wireless SpeedLAN ISP grants T1-like speedy access to the Internet.

By Les Freed

An increasing number of ISPs are offering wireless Internet access using systems such as the Wave Wireless SpeedLAN ISP. These systems offer near-T1 speeds, can be shared by many users, and don't require any expensive leased-line connections.

The SpeedLAN ISP system consists of a base unit (\$7,200 list) and one or more SpeedLAN ISP client radio card kits (\$1,800 list, each). The system uses Direct Sequence Spread Spectrum (DSSS) radio technology and operates in the unlicensed 2.4-GHz ISM (industrial-scientific-medical) band. The base unit has a range of 3 to 5 miles

and can service up to 48 simultaneous users. The SpeedLAN ISP system provides up to 2 Mbps of bandwidth that can be allocated on a user-by-user or a first-come, first-served basis. Although Wave Wireless markets the SpeedLAN ISP primarily to ISPs, we think it is equally appealing to corporate users with several business locations in one city.

The base unit of the

SpeedLAN ISP acts as an IP and IPX router or multiprotocol bridge between the LAN and the radio-connected clients. The base unit includes a small omnidirectional antenna that must be mounted outside, as high as possible. To connect to the base, each remote PC needs a client radio kit, which consists of an ISA card, a 24-inch parabolic antenna, and driver software for Windows 95, 98, and NT.

Wave Wireless recommends that the SpeedLAN ISP be installed by a certified installer or

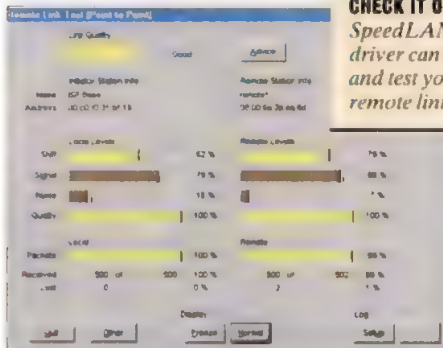
suite of tools.

Before you install the client cards, you must generate a unique key code for each client. The key code allows the system administrator to limit the connection speed of each client PC. This gives ISPs a way to sell connectivity by the kilobit and gives corporate users a way to allocate bandwidth on an as-needed basis. The client card installation is fairly simple, although the ISA radio card isn't Plug and Play, and does require that you manually set the IRQ and I/O addresses.

Informal benchmark tests using NetBench 5.01 showed a total throughput of 1.6 Mbps—very close to Wave Wireless's claimed speed of 1.8 Mbps.

Wave Wireless SpeedLAN ISP. List price: \$7,200 for base unit with antenna and installation kit; \$1,800 for SpeedLAN ISP Radio Card Kit. Wave Wireless Networking, Sarasota, FL; 800-721-9283, 941-358-9283; www.speedlan.com; 914 at www.pcmag.com/infolink.

CHECK IT OUT: SpeedLAN ISP's driver can monitor and test your remote links.



box. We installed one base and two clients on our own; each took about two hours. Configuring of the base unit is surprisingly simple. The provided Windows-based configuration program provides an excellent

Thin Server to the Rescue

The FreeGate OneGate 150 attempts to tackle the bumps on the road to Internet connectivity.

By Kevin Young

Although networking and Internet connectivity are nearly ubiquitous across large companies, a substantial percentage of small and even medium-size businesses have yet to embrace the Infobahn. The two biggest hurdles are, of course, cost and lack of expertise. Recently, thin servers such as the Whistle InterJet 100, Encanto e.go, FreeGate OneGate 1000, and now the FreeGate OneGate 150 (starting at \$2,195 list for a V.90 connection) have attempted to ease Internet connectivity pains by putting several services into a single integrated box.

The OneGate 150 (which supports up to 25 users) is a scaled-down version of the previously released OneGate 1000 (25 to 200 users). It has a slower processor and a choice of more modest connection speeds—either a V.90 modem, ISDN, or an Ethernet port for connection to devices such as DSL (384 Kbps or less). In other aspects the OneGate 150 is identical to the OneGate 1000: both run FreeBSD as their OS; both include Web, e-mail, DHCP, and FTP servers; and both include firewall, NAT, DNS, and RIP routing.

The OneGate 150 stands out among thin servers by offering optional VPN software (\$1,295), letting multiple sites interconnect inexpensively across public networks. The OneGate 150 uses IPSec with either DES or 3DES encryption for site-to-site connections and PPTP for remote-user access.

Setup is moderately difficult for a nonadministrator, but a wizard and documentation smooth the process. Once configured, administration is done

through a browser using a Java applet. We found the interface a little frustrating, as there is no command line interface for the more technically savvy.

A useful feature, however, is the ability to share the OneGate 150's file system in Windows' Network Neighborhood, letting users post files directly to the Web server. Another plus is the distinction between internal and external services for both the Web and FTP server. This allows you to set up an external Inter-

net site quickly with limited publishing rights for

users, and at the same time, start an intranet site in which all users can post to both the common page and their own home pages.

The OneGate 150's advantage is its multisite capability. If you need to get several branch offices or remote sites online quickly, the combination of the OneGate 150 and its sibling is

MY SITE: A OneGate 150 intranet Web-based home page users can create.

pretty appealing.

We found that in most cases, the OneGate 150 will succeed in easing network connectivity, but there are alternatives. You should weigh your options carefully, not only look-

ing within the thin server market, but also considering ISP hosting, or—for the brave soul—home-grown FreeBSD, Linux, or Windows NT solutions.

FreeGate OneGate 150. List price: \$2,195 for V.90 model. FreeGate Corp., Sunnyvale, CA; 408-617-1000; www.freegate.com; 916 at www.pcmag.com/infolink.

Expert E-Mail in One Box

The Intel InBusiness eMail Station gives small businesses e-mail for less time, technology, and cash.

By Jeffrey Witt

The intent of implementing technology is to add value and save on the bottom line. Unfortunately, smaller businesses have the burden of needing immediate returns, so they are

eMail Station also provides flexible connectivity and deployment capabilities. The unit attaches to your network via a 10/100 Ethernet port, and you can use either the on-board serial interface to

ONE BOX FITS ALL: The Intel InBusiness eMail Station meets all your e-mail needs.

attach a regular analog or ISDN modem, or you can use a router for your Internet

connection. You are not forced to change the way you currently handle your company's mail, because your mailbox hosting can be done either in-house or by an ISP. The system accommodates the standard SMTP and POP3 mail protocols as well as 2GB of storage space.

For our testing, we attached the eMail Station to our network, elected the option to host our own mail, and used an existing router to connect to our ISP. We worked through installation and then traded mail across the Internet and locally among our Windows NT 4.0 and 95 clients. Despite the simplicity of the installation instructions, unless you're familiar with IP address-

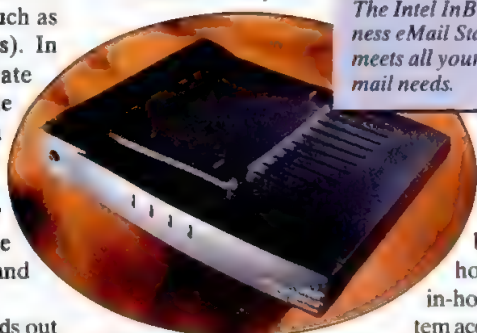
ing, domain names, and routing gateways, your experience will hinge on your ISP's willingness to help. Expect to make several calls to get things straight.

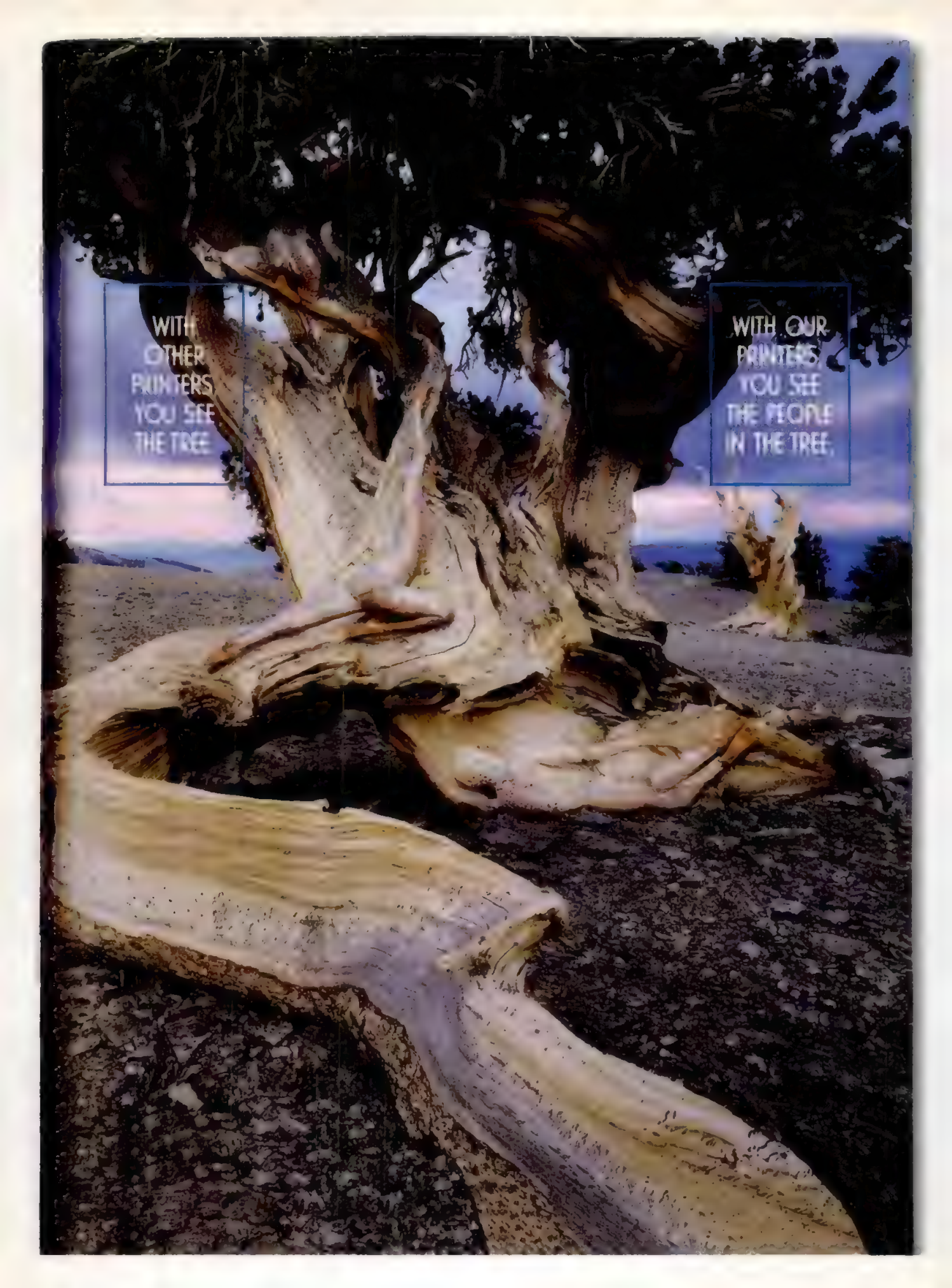
The setup procedure will install Microsoft Internet Explorer 4.0 and the Outlook Express mail client, if desired. If you are currently without Internet networking protocols, the eMail Station has DHCP and DNS services to configure your clients automatically.

Browser-based management makes it easy to add users, create mailing lists, limit disk space for mailboxes, and schedule when to send and receive mail. The auto-reply feature sends out-of-office messages and forwards mail to other accounts. Additional alerting capabilities tell you when mail can't be routed or when the disk is full, and the backup utility protects you from disasters.

The eMail Station removes the need and expense of having multiple dial-up accounts to send Internet mail or communicate internally. With its relatively low-cost, single-purpose approach, the eMail Station realizes additional savings.

Intel InBusiness eMail Station. List price: \$875. Intel Corp., Hillsboro, OR; 800-538-3373; www.intel.com; 915 at www.pcmag.com/infolink.





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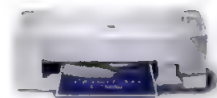
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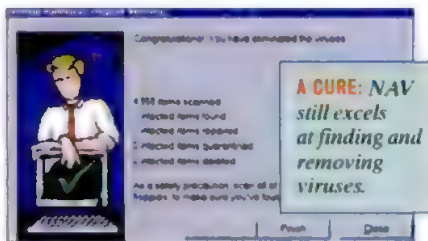
Love the Protection, Hate the Fees

By Patrick Norton

When you think of antivirus software, Symantec's Norton AntiVirus usually comes to mind. And given the consolidation in the industry just before we tested Norton AntiVirus 5.0, antivirus packages have become more important from a competitive standpoint. At least for users concerned with protecting their systems from the 4,000-or-so new viruses that appear each year.

The biggest change from NAV 4.0 to NAV 5.0 is the addition of IBM virus-scanning technology. This lets NAV 5.0 try to locate viruslike files of any type. The process takes place in NAV's virtual computer, a safe place to launch files and search for a polymorphic class of viruses.

NAV 5.0 also now has Scan and Deliver, which lets you e-mail a virus in a safe "package" to Symantec's AntiVirus Lab—a feature that at least one reader decided justified the cost of upgrading. NAV 5.0 also has the ability to update virus definitions incrementally, rather than downloading a complete defini-



tion file every time you update. That should be a time-saver, especially for people connecting over modems.

We earlier reported one glitch we found in NAV 5.0—that

about 70 percent of the time, our Windows 98 test-bed crashed during shutdown. The problem was harmless, but we found it annoying enough to report. Symantec's tech-support found a fix and posted an article on the problem on its Web site (www.service1.symantec.com/support).

But the biggest response was from a number of you who expressed dismay that NAV 5.0 doesn't include free lifetime virus

definitions, a hallmark of previous versions of NAV. Some readers are refusing to upgrade to NAV 5.0, simply to avoid the \$4.95 yearly subscription fee Symantec will charge after a year of free virus definition updates.

That's not stopping everyone from upgrading. NAV continues to excel at removing viruses, such as the 792 instances of the CIH found on one hard disk. Or, as another reader wrote in, NAV is the only software that removes the Laroux/PLDT Excel macro virus, which has been a major problem in his company.

Speech: Ready for Prime Time?

By Greg Alwang

Since our recent look at voice recognition products ("Speech Recognition: Finding Its Voice," October 20, 1998), including Dragon NaturallySpeaking Preferred 3.0, the big question has been: Have these products come of age?

Most responses to our online forum indicated that these products have matured to the point at which they can be useful to mainstream users. Dragon's focus on accuracy above all else is the catalyst to its success.

Some respondents did complain that poor accuracy made the software unusable or that an open office environment was not conducive to "talking to your computer." Others indicated the exorbitant resource requirements of speech recognition products as a major stumbling block to widespread usefulness.

For many users, the key is having patience and appropriate expectations. Training the software takes time and effort, as well as discipline regarding how you use the tools. The rewards can include high accuracy and the ability to dictate text much faster than users can type. Dragon's excellent General Training module was cited as a significant factor in reducing the burden of initial setup.

Individuals using speech recognition software out of necessity—those with disabilities, hand injuries, or just poor typing skills—responded that speech recognition has improved immeasurably over the past couple of years and by next year should be a legitimate mainstream technology. Still others feel that speech recognition is not here yet and will remain a niche application for some time.



More than a few respondents on both sides of the issue complained of the lack of support for Linux by speech recognition vendors. Several others disliked Dragon's inability to work with all sound cards or laptops. The company is aggressively working on enhancing NaturallySpeaking; a point release will be available in about two weeks with even better command-and-control and improved dictation formatting.

One thing is for certain as accuracy, command-and-control, and user interfaces improve: Continuous-speech recognition will be integrated more tightly into our mainstream applications and will surely become a bigger part of our daily computing lives.

www.secondlooks.com

Tell us what you think....How do you like the new products you're using? Second Looks is your forum for feedback. Join us online to tell us about your experiences. We discuss a different new product every week and summarize your comments here. Below, see what readers really think about voice recognition technology.

Great, if... I use Dragon NaturallySpeaking daily and I believe it can be a useful tool, if you make sure your microphone, sound card, processor and memory meet the very demanding requirements of the software, and you pay even closer attention to speaking more like a news anchor and less like Marlon Brando. As a test I trained my Dragon with the professional speaking voice on an audio book. Recognition was better than 98 percent at a speed of 160 words per minute. My own accuracy drops off quickly once I try to dictate at over 100 words per minute, but so does my ability to form coherent sentences.

—Mike Williams

Too many voices. From my desk chair, I can see and hear six coworkers. I do not want to hear all of us talking to our computers as we dictate memos. Not everyone gets his own office—or even his own cube....

—Jim Shaw

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A World Without Wires

The battle lines have been drawn. IrDA, the Infrared Data Association, has awakened from its slumber, mostly because of the threat of Bluetooth, a standard that allows devices to communicate at fairly high speeds using radio waves. If you have a laptop, it probably has an IrDA port. Chances are

excellent, however, that you've never used the port. You're in good company if you haven't; IrDA is by far the most underutilized standard feature ever built into computers, except perhaps for all those snoozing USB connectors that were waiting for Microsoft Windows 98 to awaken them.

You may have thought about using the IrDA port to synchronize your laptop's files with your desktop machine. Then you realized that you had to buy an IR transceiver for your desktop machine. And if you did that, you had to find a spare serial port to plug the transceiver into, load the drivers, and select the proper port when you wanted to sync. At that point, you probably decided that it was more trouble than it was worth; I did too.

You may also have thought about the convenience of printing via infrared, without digging in the dust bunnies behind your under-desk tower machine for the printer cable. But then you realized that your old printer didn't have an IrDA port and was working just fine. Some manufacturers (most notably Hewlett-Packard) have made a major commitment to IrDA. All their printers now have IrDA ports. So maybe your next printer will make life a little simpler.

IrDA executives concede that IrDA has been hard to use, and they have some very attractive wares to show for IrDA 2.0: speed in the low megabits, better range, local area networking, and vastly easier setup and configuration. Some advanced IrDA devices are already for sale in Japan, such as cellular phones and digital cameras. You can plunk one of the latest Sony cameras down next to your IrDA-equipped machine and have thumbnail photos on the screen in seconds. Or you can transmit them directly via cellular phone without a computer. Ericsson now offers a matchbook-size IrDA data/fax modem for your GSM cell phone.

You don't have any Bluetooth devices yet, but they're coming. Bluetooth uses frequency-hopping, low-power microwave signals to establish local connections among digital devices of all types, giving rise to the phrase *personal area network*. Many of

the same vendors that support IrDA are also showing Bluetooth prototypes. Bluetooth bandwidth is wide enough to carry voice and data, so the possibilities are great. Proponents cite casual connectivity and freedom from line-of-sight limitations among Bluetooth's advantages.

Bluetooth operates on the unlicensed 2.4-GHz band, which has its pluses and minuses. On the plus side, many devices are being built for this and similar services, so transceivers are inexpensive and will get even more so. The devices listen for a clear channel and automatically retune themselves to other frequencies when they detect interference. At these high frequencies, the subchannels can handle lots of data.

The problem is that even at 2.4 GHz, the bandwidth is finite. Because this is an unlicensed band, any number of devices can use it. At some point, they start interfering with one another. As the number of open channels decreases, the devices have to wait to transmit until they have a clear channel. Because the data is packetized, you perceive a slowdown.

You might recall that 2.4 GHz is also the resonant frequency of water molecules and therefore the operating frequency for microwave ovens. No, you don't have to worry that Bluetooth devices will turn you into a crispy critter, but this does mean that a microwave oven is an effective jammer for low-power 2.4-GHz devices. If you're working in the vicinity of one, it can easily cut throughput by 75 percent. A leaky oven can obliterate communications with all 2.4-GHz devices in the area. In addition, I'd be surprised if Bluetooth devices are allowed on airplanes.

The ability to go through walls is problematic, too. If a company on the next floor is running a sizable wireless LAN, chances are it'll be using the lion's share of the available bandwidth. Other services such as wireless ISPs also use this band, and they too will decrease the total share. Of course, when you're out of range of interfering devices, you'll have no problem.

Will IrDA and Bluetooth coexist? Will they find natural markets? Or will one wipe out the other? Time will tell. **PC**



Bluetooth uses frequency hopping to connect digital devices of all types, giving rise to the phrase *personal area network*.

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Scarier than Spam

The entire antitrust case against Microsoft was bolstered by e-mail records, many of which were simply the outgrowth of sloppy business practices and the mess that the overreliance on e-mail has created. It's going to get worse, and I see no way out of it. And I'm not talking about the Microsoft case; I'm talking about

e-mail users and what they have to face daily.

There is some irony here, because I myself have been promoting the use of e-mail as the primary form of intercompany and interpersonal nonverbal communication since I first got involved with computers. Even back in the 1970s, it was apparent that e-mail was more efficient than anything else. E-mail would have been a worldwide standard earlier had not the cheap fax machine come along to dominate the 1980s and put e-mail on the back burner.

Many of us, during the dark ages of e-mail, were plugged into CompuServe Mail, or even better, MCI Mail. Internet mail was more difficult and less universally accepted, and it appeared as if proprietary systems would rule. MCI fostered AT&T Mail and other systems, which all languished. MCI Mail itself was never improved, and before you knew it AOL came up with its "You've got mail" message and dominated the scene, followed by what we have today, which is mostly Internet mail.

Then only a few people were using e-mail, and it was manageable. Now that everyone does, it's become a disaster. This is worsened by mediocre e-mail organizational tools and a lack of verification for standard Internet mail. Combine these problems with the ubiquitous HTML "mailto:" command and the "reply to all" command and what we have is nothing less than a monster no tool can easily fix. Let's examine just a few of the e-mail problems.

- *E-mail is too easy to send.* This is the primary problem. It's simply far too easy to send e-mail, whether you need to or not. The natural barriers that force an individual to make a compose-and-send decision (printing, cost of postage, and so on) have been removed. To make things worse, it's too easy to develop mailing lists that let people broadcast e-mail as if it were bulk mail. Sloppy practices don't help, either. For example, I get numerous e-mails that don't concern me from various Ziff-Davis departments sent to broadcast lists.

- *It's too easy to reply to e-mail.* On top of the ease with which mail can be sent, it's even easier to reply

to. And the reply often has the old message embedded for reference. You also have the "reply to all" function, which turns each recipient into a broadcaster and any e-mail into nothing less than a chain letter growing in distribution with each iteration.

- *Fear of nonreceipt.* I've always considered this the biggest headache with general Internet mail. I'm not the only one, since I'm often subjected to the solution to this problem: multiple sends. I know that some people have multiple e-mail boxes, usually to help them sort through mail by levels of importance. Because I can't be sure that mail is received, no matter how many safety nets are in place to notify me of problems, I'll send multiple copies.

- *Mail storms.* Often when a mail thread begins, people will feel the obligation to chime in for no good reason except to make their presence felt. Adding "Amen," "I agree with this idea," or other such blather and rebroadcasting the message does nobody any good. And getting into an e-mail argument that is broadcast company-wide quickly becomes a nightmare. I can't imagine what productivity losses occur when a simple argument develops into a mail storm.

- *Attachments.* The ease with which someone can attach a program to an e-mail message causes bandwidth and server problems as well as lengthy downloads. Then there are support issues, such as the Mac user who wants to run the Windows program. The program, of course, is some silly animation someone collected off the Web and sent around as today's humor.

- *Organization.* This is the subject of another column. But suffice it to say, we have poor tools to sort and organize (or even find) the mail we collect.

- *The pack-rat phenomenon.* This brings us back to Gates and company and all the mail they collected for no good reason.

Needless to say, there are a lot of problems developing with e-mail, and they're continuing to grow. I didn't even have to mention spam mail to swamp you with problems. And I see no easy cure for this situation except discipline. It will sink us if we don't try to do something. Starting with strict policies would help.



Combine all the other e-mail problems with the "mailto:" and "reply to all" commands and what we have is a monster.

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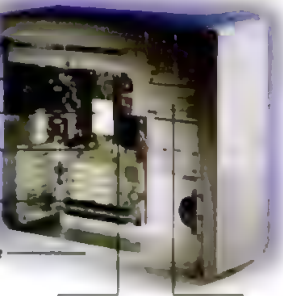
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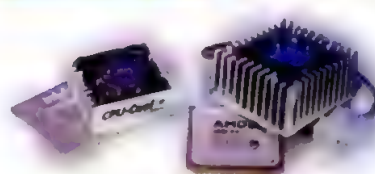
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John C. Dvorak's



INSIDE TRACK

Comdex was actually tolerable this year. The show floors were as jammed as usual with various companies trying their best to **make matters worse** with magicians and shills running carnival acts near aisles. But outside the convention center in Las Vegas, things went much more smoothly than in past years, when the city seemed to think Comdex week was the best time to do road work and to rebuild the sewer system. Because traffic flowed more easily than it has for nearly a **decade**, people assumed show attendance was severely down. It didn't seem so to me, though figures are not available as I write this column.

The main theme of the show was predictable: Flat panels were everywhere. It's apparent that flat-panel displays will be the only game in town in a few years, although Sony showed off a **stunning new tube** called the Sony FD Trinitron. *FD* means flat display: The display surface is completely flat. Executives from many of the major tube makers agree that this new tube is probably going to **boost Sony** back into the forefront of tube sellers, a position it has achieved on and off over the years but not recently. Ironical that such a tube would be developed just as we are about to turn the corner on the 21-inch flat panel. Right now, 18-inch and 19-inch flat panels are getting all the attention. I was particularly impressed with the Panasonic **19-inch flat panel**, introduced just before the show—\$2,495 including built-in speakers. Another winner is the Nokia 18-inch flat panel, which utilizes a thin layer of what appears to be polycarbonate or some such **protective material** to keep the screen from cracking. Apparently, some flat panels have been damaged by people carelessly throwing things at them out of anger at their computers! Though a pen will bounce off a CRT, it will damage an LCD panel.

Anyway, the Sony GDM-F500 21-inch monitor (a 19.8-inch viewable) will sell for around \$1,900, still cheaper than the LCD. This tube has **1,800-by-1,440 resolution**. The CPD-520GS is similar: It delivers a 1,600-by-1,200 image but costs less than \$1,300. Both monitors are stunning and use an improved version of that old Zenith "**flat tension mask**" technology that was developed years ago, then dropped because early implementations could get only as large as 15 inches and were power hogs. Evidently, Sony got hold of the patents and developed these hot new tubes. Very nice.

Sony also showed off something called **robotic entertainment** in the form of a **robotic dog**—the hit of the show. This little robot acts like a puppy and is cute beyond belief. With built-in sensors and even a gyroscope to keep balanced, such things will be quite popular someday. **I expect to see real dogs and cats picketing soon.**

The other **hot ticket at the show** was the Cyrix **WebPAD**. This is a tablet consisting of a color LCD screen and a pen. Not much bigger than a clipboard, the device has a **built-in, 2-Mbps RF transmitter and receiver**, which could load Web pages from a base station. Expect it to be used in the homes and offices of those lucky enough to have high-speed access; this is a fabulous gizmo. The parts cost for the product is about \$500, though, which means it can be expected to sell for \$2,000. The classic rule in the computer business is to multiply the parts cost by 4 to estimate the eventual retail price.

Plasma displays were also being shown, as well as some HDTV sets. The most interesting of these was a 50-inch plasma display from Panasonic. No price was given, but \$25,000 seems likely.

This year's show was **dominated** by Japanese companies showing off various concepts. Sony, for example, loaded its booth with numerous odd devices that utilized its new "Memory Stick" technology.

But the **California-based Play Inc.** may have had the coolest computer box in Las Vegas—the dedicated Trinity video-studio-in-a-box. This is the company made up of former NewTek and Grass Valley Group folks who **put aside eight years** to make this \$5,000 switcher/special-effects box. At Play Inc.'s booth was a demonstration called "Two Guys on a Couch." It was a mock broadcast from a fictitious high school that was one of the best demos I've ever seen. It was hilarious and riveting. It made me want to **get a Trinity** and make videos.

The city itself was **highlighted by new hotels**. The Bellagio was at the top of the list and was where all the bigwigs were staying, including Gates,

Ballmer, Pfeiffer, Waitt, Dell, and Cowpland, to name a few. The place is modeled on a small Italian village and contains some of the best restaurants in town, as well as an array of unusual nightclubs. Across the street, they are putting the finishing touches on the Paris, a fascinating hotel that has what appears to be a **one-third-scale Eiffel Tower** and Arc de Triomphe, as well as a Paris street. It does look very French. All the place needs to make it authentic is some rude personnel. If you tell that joke, everyone will say, "Get them from the Hilton!"

Down the street, a new megaresort called Mandalay Bay is going up, amid some **trepidation**. A rumor is flying that it was built on top of slightly unstable soil. Allegedly, the building has sunk 17 inches or more already. Lawsuits are expected to fly as well. If the problems are resolved, it will be quite a stunning place, with kind of an island theme. Currently there are 106,000 rooms in Las Vegas, with 20,000 to be added. This marks either a new boom or a glut. We'll see. **PC**

Flat-panel displays will be the only game in town in a few years; another hot ticket, the Cyrix WebPAD, will be used by those lucky enough to have high-speed access.

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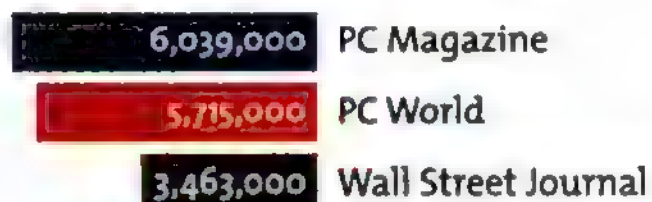


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Two More Win 98 Tips

Several issues back (November 17, 1998), I passed along what I called “the ultimate Win 98 install tip.” (In case you missed it, the column reveals the workings of Windows’ little-known but critical Version Control Manager. You can find the column online at www.zdnet.com/pcmag/insites/js981030.htm.)

I’ve already had a pile of reader mail thanking me for that tip and asking whether I had any more similarly obscure but useful tricks up my sleeve. Here are a couple—not perhaps as potent as turning VCM to your advantage, but well worthwhile for anyone running Microsoft Windows 98, and in the case of the second tip, for Windows 95 users as well.

Tip 1: Win 98’s new System File Checker is almost as deeply buried as VCM, and it’s nearly as useful. It can search your Win 98 installation CD for missing or damaged files, then uncompress and reinstall them.

Why would you need this?

In my long experience with PCs—especially with notebooks, and even more (I’m sorry to say) with Win 98—system files have a way of randomly disappearing. You boot up and find an infuriating screenful of DOS-level text: *Can’t find abc.dll*, and so on. In a way, that ugly message is good news: If the file that’s gone is truly system-critical—that is, your PC can’t run without it—you probably won’t even get to the message; instead, the box will simply lock up.

But it’s hard to think “good news!” when your PC is snarling ugly DOS error messages at you.

Because it’s almost always a system file—maybe even more than one—you know the replacements are lurking somewhere on your Windows installation CD. But finding them, uncompressing them, and getting them installed in the right place means searching for that damned CD and then wrestling with Microsoft’s crummy CAB-file directory-and-unpack tools. Grrr....

System File Checker (SFC) makes that routine much easier. Once you know how to use it.

Over the years I’ve gotten in the habit of keeping my notebooks’ Windows installation CDs in their CD drives. That way, when I’m on the road and need to fix something, the resources I need are right there. I keep CD AutoPlay off, so that the Windows CD doesn’t try to start a new installation every time I turn the machine on. You should too—by keeping the Start | Settings | Control Panel | System | Device Manager | CD-ROM | Settings | “Auto insert notifi-

cation” box unchecked—because AutoPlay steals way too many CPU cycles for its marginal benefits.

Now, with that CD in the drive, click on Start | Programs | Accessories | System Tools | System Information | Tools | System File Checker. (They sure tried to hide this one, didn’t they?) Click on “Extract one file from installation disk” and enter the name of the file Windows said it didn’t find when you boot-ed up. Then click on Start. When the Extract File window appears, click on the Browse button to find the “Restore from” line and enter the correct address for the file, which will be found in *X:\Windows 98\win98* (where *X* is the drive letter for your CD-ROM drive). Make certain the *C:\Windows\System* folder is shown on the “Save file in” line.

Bingo! System File Checker searches through all those CAB files on your Windows CD, finds the needed file, uncompresses it, and reinstalls it in the correct place. One frustration: You have to do this file by file if your PC reported more than one missing during boot-up. SFC just isn’t smart enough to handle retrieving more than one missing file at a time.

Even though System File Checker is buried so deeply, this is a far faster and more reliable way of restoring munged files than the manual approach.

Tip 2: Use desktop shortcuts minimally, instead adding frequently used programs to your Start Menu—and with Win 98, to the Quick Launch bar.

When Windows 95 came out and made shortcuts on your desktop practical and useful, I fell hard for them. Before long, Windows wallpaper was redundant for me, because I had so many shortcut icons littered across my desktop I wouldn’t have been able to *see* wallpaper. I’m obsessive enough to have spent time lining them up—and realigning them, and realigning them, and realigning them, as they crept around because of sloppy program-launching double-clicks. (Why has Microsoft never added a “lock-down” option for desktop icons, to end icon creep?)

But that became self-defeating, as does overuse of any time-saving trick.

I began dragging the EXE icons of my most-used



Win 98’s System File Checker is almost as deeply buried as VCM, and it’s nearly as useful.

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programs to the Start button, so those programs appeared on the Start Menu. I keep the Start | Settings | Taskbar and Start Menu "Show small icons in Start menu" box checked, letting me easily see as many of these quick-start entries as I need. I try to stay below 20 entries, so the list I have to scan isn't too long.

With the advent of Win 98, we got the Quick Launch bar, that little cluster of mini-icons at the lower-left edge of the screen to the right of the Start button. It comes preloaded with some icons, but you can dump those you don't need by right-clicking on them and choosing Delete or just dragging them to the Recycle Bin.

Then drag the program icons of the programs you use most to the Quick Launch bar. You can choose where they appear, left to right, by dragging each icon before you drop it, noting the black I-beam marker's position. This gives you three possible fast-access program-launching positions (in addition to creating context-sensitive right-click entries, which use pop-up menus on-screen—and which I dislike).

My approach: I use almost no desktop shortcut icons, put my most-used programs on the Quick Launch bar, and put somewhat less used but still important programs in the Start Menu.

There's one big advantage to the latter two choices, by the way. You can get at icons much more easily when you're running other programs than desktop shortcuts. For example, I keep Word, Excel, Outlook 98, PageMaker, Hotline, and Ecco in my Quick Launch bar, but I keep Character Map (charmap.exe)—the Windows utility that displays all the characters in a font with their Alt + 0xxx assignments—in my Start Menu, since I often use it while I'm running other programs but don't use it as a primary app.

Make sense?

I confess: I still use desktop shortcuts. When I'm cruising the Web, I often save pages to the desktop, where they appear as icons, then later sort and move them into appropriate folders. That's faster than rumbling around in Windows' "Save As..." box every time to find the right directory. 

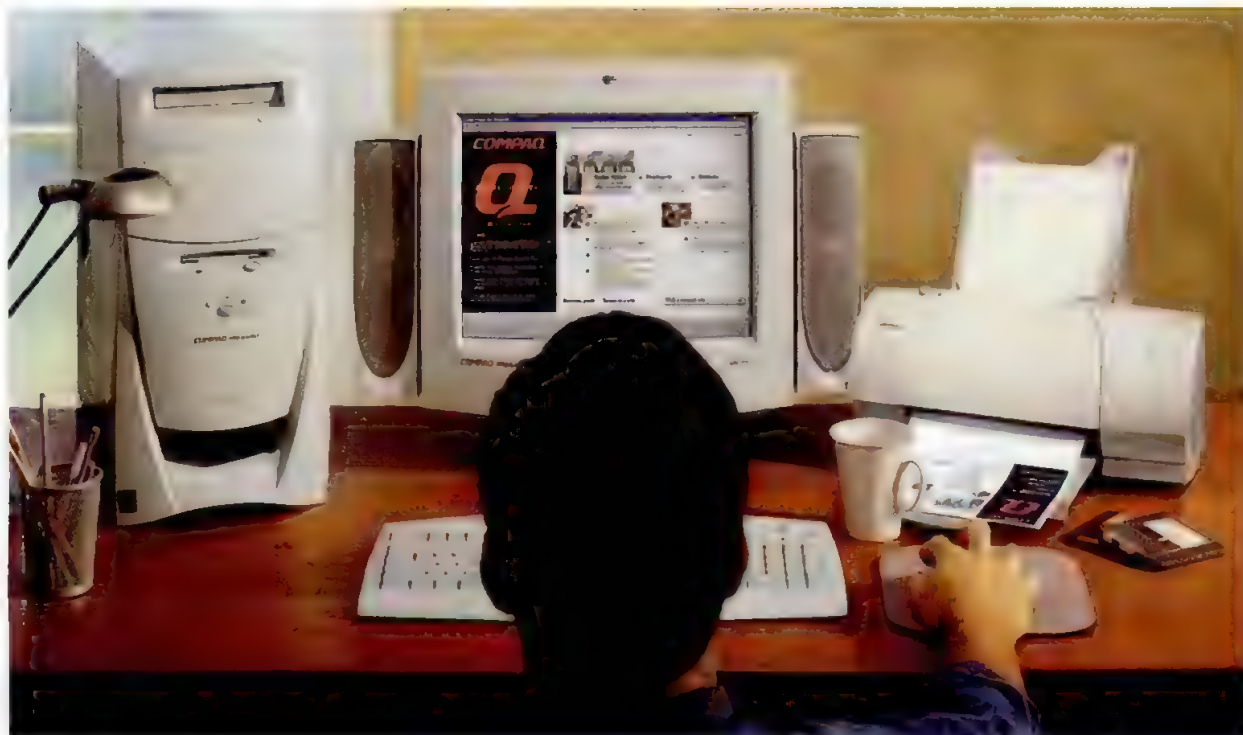
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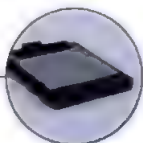
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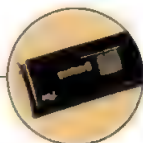
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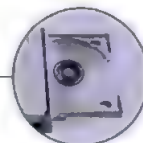
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- New! Iomega Zip Built-In™ Drive
- Microsoft Featured Home Collection
- Microsoft Windows98
- Compaq V720 17" Monitor (15.9" VIA)

Personalize it by choosing:

- 128 MB SyncDRAM: Add \$100
- Compaq V910 19" Monitor (18.0" VIA): Add \$170
- Diamond Viper 550 AGP w/16 MB SDRAM: Add \$50

Compaq Presario 5600-350

\$1,599
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Base price includes:

- Intel Pentium II Processor, 350 MHz
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- 64 MB SyncDRAM expandable to 384 MB
- 56K ITU v.90 Modem³
- 2X AGP Graphics w/8 MB SGRAM
- 10 Mbps Ethernet port, Cable Modem Ready
- JBL Pro Speakers
- New! Iomega Zip Built-In™ Drive
- Microsoft Featured Home Collection
- Microsoft Windows98
- Compaq V720 17" Monitor (15.9" VIA)

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Buy one of these computers and get **50 free hours** on the Net⁵. Plus, get a **\$100 rebate** on these select Compaq Presario minitower, desktop, or notebook PCs when you sign up for this Compaq Easy Internet Access free trial.⁶

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American Appliance,
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Best Buy,
Big City Express,
Brandsmart USA,
Campo Electronics,
Circuit City, CompUSA,
CompUSA Direct, Computer City,
Computer Discount Warehouse,
Computer Town, Conn's,
DataVision, Fred Meyer,
Fry's Electronics,
Future Shop,
the good guys!,
h.h. Gregg, Insight,
J&R Computer World,
Micro Center,
MicroWarehouse,
Multiple Zones,
Nationwide Computers & Electronics,
Nebraska Mega Mart,
Nobody Beats the Wiz,
Office Depot, OfficeMax,
PC Connection, PC Mall,
PC Richard & Son,
PC Warehouse,
RadioShack,
RCS Computer Experience,
Sears, Staples,
State Street Discount,
Sun TV & Appliances, Inc.,
Tiger Direct,
Tops Appliance City,
T-Zone.



Compaq Presario 1800-266

~~\$2,199~~
-\$100 mail-in rebate**

\$2,099

Base price includes:

- Intel® Pentium® II Processor, 266 MHz
- 12.1" TFT Active Matrix Display
- 64 MB SyncDRAM expandable to 160 MB
- 4.0 GB Ultra DMA Hard Drive¹
- 24X Max CD-ROM Drive²
- 56K ITU v.90 Modem³
- Smart Li-Ion Battery
- 512 KB L2 Pipeline Burst Cache
- 256-bit Accelerated Graphics w/2.5 MB VRAM
- Microsoft® Featured Home Collection
- Microsoft Windows®98

Personalize it by choosing:

- 96 MB SyncDRAM: Add \$100
- 6.4 GB Hard Drive:⁴ Add \$200
- Brief Carrying Case: Add \$119



More value from Compaq!

All Compaq Presario 5600 Series Custom "Built For You" PCs now include an Omega Zip Built-In[®] Drive. So don't delay — call today or visit your nearest participating Compaq "Built For You" retailer. (Presario 5170 shown.)



Compaq Presario 1800-300

~~\$2,599~~
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\$2,499

Base price includes:

- Intel Pentium II Processor, 300 MHz
- 12.1" TFT Active Matrix Display
- 64 MB SyncDRAM expandable to 160 MB
- 4.0 GB Ultra DMA Hard Drive¹
- 2nd-Generation DVD-ROM Drive²
- 56K ITU v.90 Modem³
- Smart Li-Ion Battery
- 512 KB L2 Pipeline Burst Cache
- 256-bit Accelerated Graphics w/2.5 MB VRAM
- Microsoft Featured Home Collection
- Microsoft Windows98

Personalize it by choosing:

- 96 MB SyncDRAM: Add \$100
- 6.4 GB Hard Drive:⁴ Add \$200
- Brief Carrying Case: Add \$119



Compaq Presario 1800-300

~~\$3,199~~
-\$100 mail-in rebate**

\$3,099

Base price includes:

- Intel Pentium II Processor, 300 MHz
- 13.3" TFT Active Matrix Display
- 96 MB SyncDRAM expandable to 160 MB
- 6.4 GB Ultra DMA Hard Drive¹
- 2nd-Generation DVD-ROM Drive²
- 56K ITU v.90 Modem³
- Smart Li-Ion Battery
- 512 KB L2 Pipeline Burst Cache
- 256-bit Accelerated Graphics w/2.5 MB VRAM
- Microsoft Office 97 Small Business Edition
- Microsoft Windows98

Personalize it by choosing:

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- Executive Leather Carrying Case: Add \$200
- Port Replicator: Add \$100



Omega Zip Built-In[®] Drive

- The standard in 100 MB portable storage
- One Zip disk equals the capacity of 70 floppies
- Reliable backup of your important stuff
- Easily carry files between work and home
- Plus: Buy a Zip 10-pak for only \$99 — so everyone in the family can store their own stuff

Compaq LJ200

\$129⁹⁹

- Single-head thermal inkjet technology
- Up to 600 x 600 DPI resolution
- Sharp text and sharp color prints
- Print Speeds:
Up to 3 1/2 pages per minute black
Up to 1 1/2 pages per minute color
- Paper tray holds up to 30 sheets

Every Compaq product comes with a standard one-year limited warranty⁷ and the assurance of our Extra Mile Service, the most comprehensive and flexible PC support available. You'll have access to fast, accurate, 7x24 technical support via the phone or Web.



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Buy direct from Compaq, or purchase yours at your favorite retailer.
Visit us at **www.compaq.com/athome** or call **1-800-376-9357**.



*The 5X DVD-ROM Drive transfer rate is up to 6,750 KB/s compared to 1,352 KB/s for 1X DVD-ROM Drives. ²2nd-Generation DVD-ROM Drives run at a higher maximum transfer rate of up to 2.76 MB/s compared to 1st-Generation DVD-ROM Drives which run at a maximum transfer rate of up to 1.348 MB/s. ³One year parts and labor. Labor for desktop systems is carry-in service with on-site service during the first 90 days of ownership. Labor for notebook systems is pick-up service. ⁴The 1.5Mbps Digital DSL Modem (G.Lite/56K V.90) modem protocol is designed to allow faster downloads from G.Lite/56K V.90 compliant digital sources. Availability of services will vary by region and Internet Service Provider (ISP), and may differ from V.90 ISP services. Maximum achievable download transmission rates with G.Lite/56K V.90 are currently unknown, may not reach 1.5Mbps or 56Kbps, respectively, and will vary based on service provider, line conditions, and distance. Compaq is not liable for pictorial or typographical errors in this advertisement. Compaq, the Compaq Logo, and Presario registered in U.S. Patent and Trademark Office. Microsoft, MSN, and Windows are registered trademarks of Microsoft Corporation. Intel, the Intel Inside Logo, and Pentium are registered trademarks of Intel Corporation. Product and company names mentioned herein may be trademarks and/or registered trademarks of other companies. **Call Compaq Monday-Friday 7:00am-11:00pm (CST), Saturday and Sunday 7:00am-7:00pm (CST).** ©1998 Compaq Computer Corporation. All rights reserved.

COMPAQ
Better answers.SM

Twenty Questions

Why can't I drag and drop unstructured e-mail text into a scheduler so that it figures out the date and time automatically? Ten years ago, Lotus Agenda had the smarts to know that if today were January 19, 1999, "Let's set up an 11:00 meeting next Monday with the Binford reps" would mean Monday,

January 25, 1999, at 11:00 A.M., with Binford Corp.

Similarly, why do so many schedulers require you to add A.M. or P.M. to the time? If you type "3" in the time field, that should be enough to identify a 3:00 P.M. meeting. For those rare 3:00 A.M. conference calls, you can make a manual change.

Why do different multimedia applications running on the same PC at the same time with the same volume settings produce such widely disparate sound levels—some too soft to hear, others too loud to bear?

Why do so few PCs have a mute button front and center on the system unit, monitor, or keyboard?

How come when you do a Find File and get back "18 files found," the results window doesn't expand to show a results box 18 entries deep?

Why do so many apps use a drop-down list box when the choices are only yes/no or on/off? List boxes may require two or three mouse clicks (activate, choose, close), radio buttons only a single click.

How come when you have a big-screen monitor with lots of real estate, there isn't an option for File/View/Half Screen? Similarly, how come when you have five programs running, you have no option to view *this* and *this* each as half the screen or two-thirds/one-third, without having to move and size multiple windows?

Why do we ever see, "Error: This file is too large for Notepad to open. Would you like to use Word-Pad to read this file?" Isn't the answer always yes?

How come when you're attaching a file in your e-mail program, you don't get a "most recently used files" list? The file I'm about to attach most likely is the one I just finished creating or editing.

How come the hook-and-loop (Velcro) fasteners that secure notebook transformer power cords work if you wind them one way (such as left to right) but not the other? How much more would it cost to use double-sided Velcro?

Why don't word processors and e-mail programs have simple math features in case you want to total a column of numbers? The math feature in Microsoft Word has gotten too hard for mortals to use.

Why aren't there better duplex printer drivers (which print on both sides) for the day planner books that are still going strong in the face of hand-held organizers?

Why are user-registration serial numbers so long? You need only 10 digits to have a unique ID for everyone in the world—13 digits would cover each dollar of the national deficit—but my Microsoft Windows 98 serial number, for instance, is 25 characters. Not that it's ever going to happen, but wouldn't it be great if the serial number were etched onto the top of your CD, rather than on the box or jewel case, which you're likely to lose?

Why do otherwise reliable notebook PCs fail to go into suspend mode, instead freezing on you—still drawing battery power—when you most need to close the cover and power down in a hurry so you can get on the plane? And isn't it a sinking feeling when 45 minutes into the flight, you reach into your carry-on bag and find the system unit is almost too hot to touch, and you know the battery for sure is half dead, and you wonder if you've overheated the innards?

Why do you have to restart your PC after installing or uninstalling some apps? Shouldn't the OS be smart enough to figure out what goes where?

Why do we have to put up with operating systems and programs that manage memory and resources so poorly and slow your PC so much that you have to reboot during the day to reenergize your system?

Why do some online registration forms clear every entry if you make even one mistake, making you start over from scratch?

Why don't trip planning and mapping programs let you easily drop out the background tints when you print, to save time and avoid wasting ink?

When you start a group file transfer and head off to get coffee, and there's one exception file (let's say it's active in another window), why can't the transfer software act on the other 999 files and then cycle back to the lone exception?

What's the purpose of screen savers these days, besides giving you one more thing to tinker with? **PC**



Bonus question:
Why can't more software do "sounds like" (soundex) searches, in case your spelling is off?

More on the Web:
Join us online and make your voice heard. Talk back to Bill Howard in our Opinions section.

www.pcmag.com/opinions

BEST WEB SOFTWARE DOWNLOADS

FREE

(and nearly free)

STUFF

AND

WHERE
TO GET IT

By GAIL SHAFFER

Downloading free—or close-to-free—software is *still* one of our favorite things to do online, after all these years. That magical moment has happened for each of us somewhere along the way: You find that little gem of a program and download it, and it solves one of those nagging problems you've been dealing with, or better still, it does some cool trick that turns out to be both fun and useful. Or it's just a great game.

Yup. We know you love this as much as we do. So we've pulled together a bunch of thumbnail reviews under seven different categories. These represent the best of

the thousands of free and shareware programs available on the Web. Freeware is yours to keep for good; trialware is free but crippled and may ultimately time out, and shareware programs nag you to register and pay for the software. If you don't, they time out after 30 days or so. We also review eight of the major software download sites for you.

Enjoy downloading while you can, because as more features are glommed on to by operating systems or gobbled into application and utility suites, downloadable software could soon fade away.

Nah!

Internet

SYSTEM UTILITIES

WinZip 7.0

944K • Free evaluation, \$29 license

★★★★★

Because many of the programs in this roundup are compressed for quicker downloading, a solid compression/expansion tool is a must-have. And with its most recent release, WinZip—the king of compression tools—has only gotten

IN THIS REVIEW

System Utilities	100
Microsoft Office	
Add-Ons	102
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Communications Tools	104
Organizational Tools	104
Web Development Tools	114
Games	114
Where to Get It:	
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stronger. The tool adds features such as CAB file support and the ability to print out lists of files contained within ZIP archives.—*Josh Taylor*
Nico Mak Computing Inc.,
www.winzip.com.

Drag and View 95 v.4.0c

2.6MB • Free for 60 days or 60 uses (whichever is longer), then \$30 via the Internet or \$35 by mail

★★★★★

With a simple right click, Drag and View 95 lets you view and perform basic editing functions on more than 40 file types, ranging from word processing and spreadsheet files to animated GIFs and WAVs.—*JT*
Canyon Software,
www.canyonsw.com.

Yet Another Tray Launcher 3.02

1.4MB • Free evaluation; \$10 license

★★★

Frustrated by having to navigate several menus deep in the Start Menu to find a certain program? Yet Another Tray Launcher (YATL) helps you find what you're looking for faster, via a System Tray icon. An AutoScan function puts frequently used files in YATL's menu, and any file can be added to the menu via a right-click command.—*JT*
Swoosie Software,
www.xmission.com/~myq/swoosie.html.

ClipCache 2.1

856K • 30 days free trial, then \$14.95

★★★

A vast improvement over the single clip the Windows Clipboard allows, ClipCache lets you cut and copy an unlimited number of text files, bitmaps, and enhanced metafiles to an extended clipboard. The program, accessible via a System Tray icon, also lets you edit, search, and combine clippings.—*JT*
xrayz software,
www.xrayz.demon.co.uk.

My Fonts 3.2

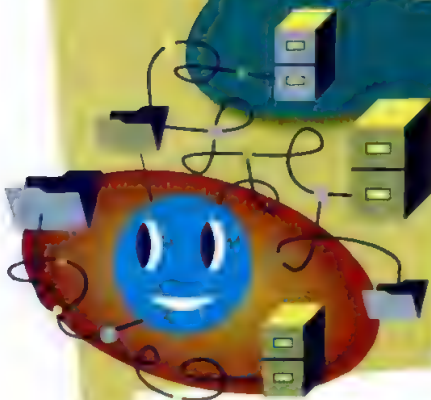
704K • Free evaluation; \$35 license

★★★

MyFonts provides easy management of both TrueType and PostScript fonts. The program allows for easy comparison of typefaces, viewing and printing of type samples, and creation and editing of fontpacks, used for grouping typefaces.—*JT*
MyTools.com,
www.mytools.com.

Our Contributors: PC Magazine staff members GAIL SHAFFER, BEN Z. GOTTESMAN, JAY MUNRO, and DAVID LIDSKY (who managed this story); contributing editors EDWARD MENDELSON and JAN OZER; and freelance writers ALAN COHEN, JOHN GARRIS, SARAH L. ROBERTS-WITT, and JOSH TAYLOR.

TIPS ON WEB DOWNLOADING AND STORAGE

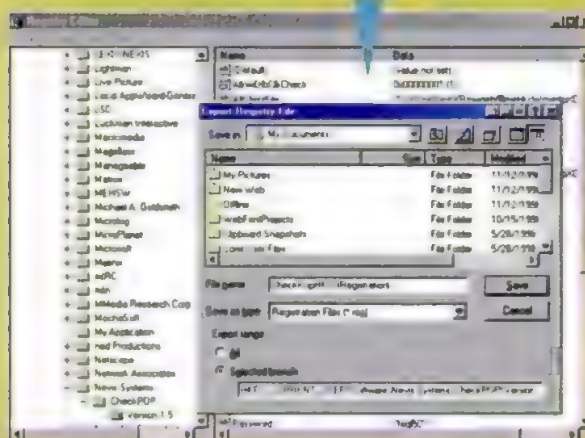


Thanks to the Internet, you're now more likely to download utility software than to buy it on a disk. This means you need to plan ahead if you want to be able to reinstall a program

in the future on a new system—or on your current system after a disk crash. Here are some tips that can help you reduce frustration and loss.—Edward Mendelson

* Regedit

Technically proficient users may also want to export the entries in the Windows registry for shareware and freeware to avoid setting up default settings by hand when reinstalling. Use Regedit.exe, find the keys for the programs under *both* HKEY_CURRENT_USER and HKEY_LOCAL_MACHINE, and export them to files. Don't even think about doing this if you're not already proficient with Regedit.



* Check for Viruses

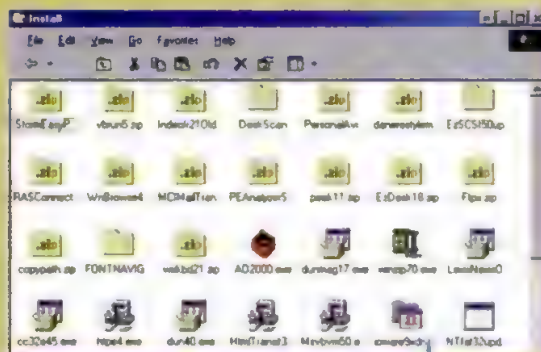
Most download sites offer no warranties that the programs you're downloading are virus-free. While we didn't encounter any problems during testing, you should still take this into consideration and run your virus software on any programs you download before installing them.

* Keep Copies

Keep copies of all unlocking codes and registration keys. Maintain a text file or database with a complete list of all codes and keys, as well as the e-mail addresses of program authors. Remember that an author may not be reachable if you want to reinstall the program and no longer have the registration code you paid for.

* Save Numbers

If you pay for a program online, print out any order number or similar information that appears in the browser *before* you start downloading. If the download is interrupted, you may be able to resume the download by returning to the download site and entering your order number. Or you can e-mail the order number to the vendor and request that a copy of the program be e-mailed to you. Any responsible vendor will honor your request.



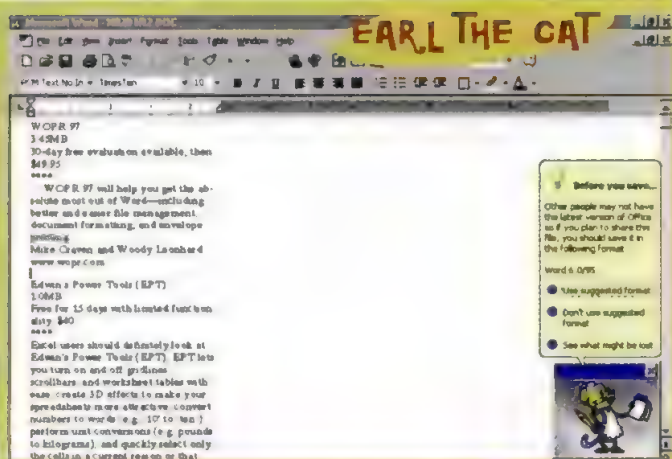
* Create a Folder

Create a special folder on your disk for downloaded ZIP archives and installers. If you direct all downloaded installers into C:\Install, they'll be there when you need to reinstall. If you use an Iomega Zip or Jaz Drive, or other removable media, keep an archive of installation programs. The originals may no longer be on the Web when you want them again in the future.

DOWNLOAD ALL THIS STUFF!

Visit PC Magazine's Web site for links to all the utilities, add-ons, tools, and games reviewed here:
www.pcmag.com

Best Web Software Downloads



Set Me Up 98 v3.5d

23MB • Free evaluation, \$35 license

★★★★

Set Me Up makes it easy for even the most timid users to customize their Windows-based systems. The program tweaks system start-up and shutdown screens and drive icons and automates backup of system files.—*JT*

Omniquad,

www.omniquad.com.

File Ferret 32

3.6MB • 30 days free trial, then \$27.95

★★★★

If it's on your disk, File Ferret 32 will find it. Search by size, date, or text strings; or create complex search criteria that you can reuse. Clever icons will guide you.—*Alan Cohen*

Fineware Systems,

www.fineware.com.

MICROSOFT OFFICE ADD-ONS

WOPR 97

3.5MB • 30-day free trial, then \$49.95

★★★★

WOPR 97 will help you get the absolute most out of Word. This tool permits better and easier file management, document formatting, and envelope printing.—*Ben Z. Gottesman*
Mike Craven and Woody Leonhard,
www.wopr.com.

Edwin's Power Tools

1MB • 15 days free trial (limited functionality), then \$40

★★★★

Excel users should definitely look at Edwin's Power Tools (EPT). EPT lets you turn on and off grid lines, scroll bars, and worksheet tables with ease, create 3-D effects to make your spreadsheets more attractive, convert numerals to the corresponding words, perform unit conversions (such as pounds into kilograms), and quickly select only the cells in a current region or those containing data.—*BZG*

Edwin Tam,

users.vol.net/edwintam.

Power Utility Pak 97 (PUP97) provides many utilities similar to those of EPT. It also adds over 40 new functions, such as Whichday (which tells you what date the *n*th weekday of the month falls on), and Count-between (which returns the number of values falling between two numbers).—*BZG*
JWalk and Associates Inc.,
www.j-walk.com.

Office Assistant: Earl the Cat

2.25MB • Free

★★★

Hate Microsoft's Office Assistant? Maybe you're using the wrong one. Download Office Assistant: Earl the Cat, the Assistant with an attitude. Earl fends off sharks and monsters, dresses in drag, and even pushes up the daisies, all while helping you get the most out of Microsoft Office.—*BZG*

Microsoft Corp.,

officeupdate.microsoft.com.

INTERNET TOOLS

Copernic 98 v2.51

2.2MB • Free

★★★★★

Copernic 98 queries multiple search engines, scouring the

vancy rankings that really do seem relevant, and search results that can be saved, sorted, and updated.—*AC*
Agents Technologies Corp.,
www.copernic.com.

ActiveCaption

400K • Free

★★★★

ActiveCaption takes advantage of the unused space on the title bar of your browser (IE or Navigator) to speed your Web navigation. The left side of the ActiveCaption bar lets you quickly search many of the Internet's top engines and shop for books, music, and more. The program's bookmark manager lets you easily categorize your favorite sites, merge multiple bookmark lists, and move bookmarks between systems.—*BZG*
OneSeek,
www.oneseek.com.

Cache and Cookie Washer

899K (IE), 761K (Netscape) • 30 days free trial, then \$14.95

★★★★

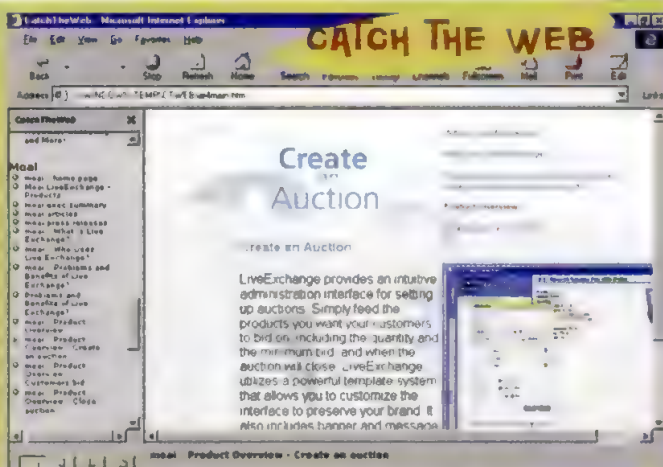
Like to wander the Web but don't want to leave a trail of bread crumbs behind? Cache and Cookie Washer will automatically clean out your cache to remove all record of the sites you visited. The program also lets you selectively remove cookies—files that Web sites store on your hard disk to keep information about you. Unfortunately, cleaning the cache is an all-or-nothing deal. The \$30 Window Washer tool supports both browsers as well as Windows' Document, Find, and Run histories.—*BZG*
WebRoot Software,
www.webroot.com.

CatchTheWeb 1.08

2.2MB • 30 days free, then \$39.95

★★★★

A power tool for Web researchers, CatchTheWeb



Power Utility Pak 97

1.1MB • 30 days free trial (limited functionality), then \$39.95

★★★★

Web and newsgroup postings for the information you need. The program has a well-designed user interface, rele-

WHERE TO GET IT

THE SITES

To help you along in your relentless pursuit of software gems—such as the ones reviewed in this story—we take a hard look at eight software “hub” sites to help you find the best place to get what you want.

DaveCentral

www.davecentral.com

Quick take: DaveCentral is among the best download sites, particularly for browsing.

Pros: Intuitive organizational structure; brief but usually informative overview of what each product does. There is usually a screenshot, something no other site offers.

Cons: Search is limited to simple keywords—try navigating instead. No ratings system, so choosing the best product requires some work.

Download.com

www.download.com

Quick take: Akin to ZDNet Software Library in terms of the quantity of software titles and the abundance of features, Download.com does not have as much descriptive product information as we would have liked, making it difficult to choose what to download sometimes.

Pros: Search is capable, letting you do full-text searches and filter by popularity, neither of which is possible at Software Library. An excellent results screen lets you sort by title, date, and popularity on the fly, and tells you how many products your search returned.

Cons: You can't filter by file size or rating, as you can at Software Library. No ratings. Sites such as Stroud's Consummate Winsock Apps offer more detail about each product.

NoNags.com

www.nonnags.com

Quick take: This site is notable for listing only freeware and fully functional shareware.

Pros: Categorizes its downloads into freeware and shareware. Focused specifically on Windows 95, 98, and NT apps.

Cons: Poor search capability; some broken links when we tried to download software. Ratings, but no justification behind them—almost every product is either a 5 (good) or 6 (best).

SoftwareNow.com

www.softwarenow.com

Quick take: This site is as bare-bones as it gets.

Pros: Decent array of software.

Cons: No search mechanism at all; lack of detailed reviews. Site design is poor.

Stroud's Consummate WinSock Apps

www.internet.com

Quick take: Your best bet for Internet apps, the site's sole focus.

Pros: Reviews often include comparisons with similar products and offer pros and cons—the best analysis of any site. Discussion boards for posting and reading comments about products.

Cons: You have to sift through the categories to find what you want, because the search function is one of the weakest in this roundup. Fewer products than Software Library.

TUCOWS

www.tucows.com

Quick take: A lot like Stroud's in terms of the software and quality of information available, Tucows has more products to choose from, although the amount of information isn't as great.

Pros: Reliable ratings (from 1 to 5 “cows”). Like Stroud's, Tucows provides Web-based forums for posting messages. Surveys its users about available products and publishes results.

Cons: Information not as deep as

site before downloading.

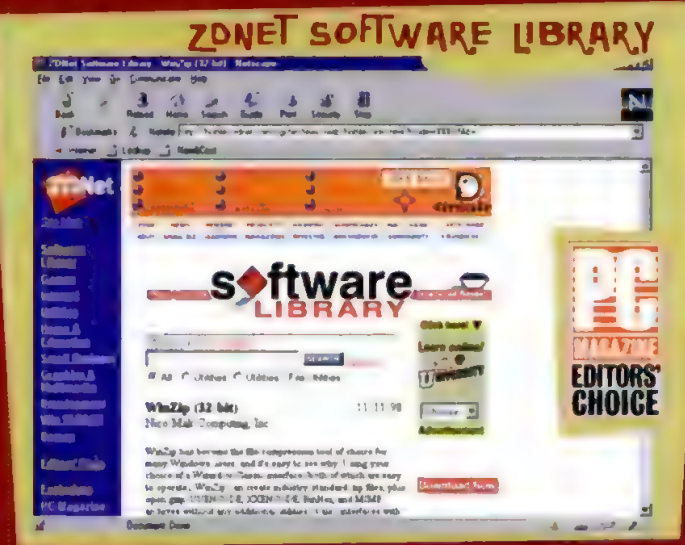
Cons: The navigation scheme looks like a Windows 9x large-icon view of a directory window, which is less intuitive than the Yahoo!-like directory navigation you'll find at DaveCentral and Download.com.

ZDNet Software Library

www.hotfile.com

Quick take: If you could go to only one site to download files, ZDNet Software Library should be the one. It features the most power of any site we looked at, but you may have to hunt around more than you'd like if you don't know what you want. (ZDNet is run by Ziff-Davis, the parent company of PC Magazine.)

Pros: Brief but useful synopsis of each application along with a star rating. Best power search,



at sites such as Stroud's. Search limited to basic keywords.

WinFiles.com

www.winfiles.com

Quick take: This overwhelming site for Windows 95, 98, NT, and CE software has poor searching and browsing mechanisms.

Pros: Literally thousands of available products. Some products let you register online through the

uniquely letting you filter by rating and file size. The only site we reviewed with a shopping cart that lets you store files as you find them to download later.

Cons: You can't limit the number of search returns or see how many total returns you received. It's sometimes difficult to find what you want by browsing without clicking through far more pages than at most other sites.

—John Garbis

captures Web pages, e-mail, and newsgroup messages from Internet Explorer and Outlook Express, preserving all formatting, graphics, and links. Then you can annotate and organize the content to produce a stand-alone presentation for off-line viewing.—*Jan Ozer*

Math Strategies,

www.catchtheweb.com (free trial only at www.download.com).

WebVCR

1.9MB • 15 days free trial, then \$39.95

★★★★

NetResults picked the perfect name for its off-line browser. After all, like a VCR, an off-line browser makes a recording that can be viewed at any time. WebVCR can even be programmed to start recording whenever you want (although there's no blinking 12:00 A.M. option). You can easily grab entire subsections of a Web site without filling your hard disk with a bunch of useless links. A floating toolbar gives you quick access to record and playback functions while you're in your browser.—*BZG*

NetResults Corp.,

www.netresultscorp.com.

Internet Graphics Finder 2.0

1.7MB • Free evaluation; \$14.95 license

★★★★

This easy-to-use application lets you find, extract, view, and save images found across the Web. Type in a keyword and matches appear as thumbnails. When you see what you want, hit the browser button and the picture displays at full size. Registering adds a handy print capability.—*AC*

SkibbySoft,

www.skibbysoft.com.

COMMUNICATIONS TOOLS

CheckPOP 1.5

860K • 14 days free trial, then \$12.99

★★★★

Compact and beautifully designed, CheckPOP 1.5 is the best tray-based e-mail checker. It's the only utility of its kind that lists your new mail from the Start Menu, a keyboard shortcut, or the taskbar tray.—*Edward Mendelson*

n-Systems,

www.n-systems.com/checkpop.

NetLaunch 3.14d

124K • Free

★★★★★

This indispensable program monitors Dial-Up Networking connections and automatically launches programs such as a time-checker or browser when you connect. Different programs can be set to run with different connections.—*EM*

Black Castle Software LLC,

www.blackcastlesoft.com/netlaunch.

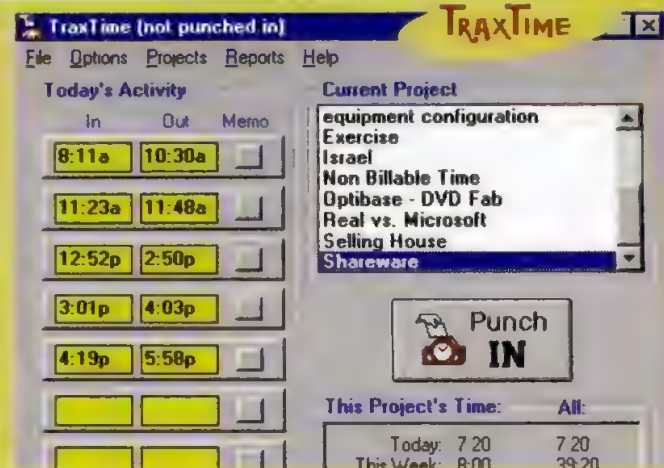
AOL Instant Messenger 2.0

1.7MB • Free

★★★★

Quicker than e-mail and less rowdy than chat, instant mes-

saging is a great way to converse online with friends and colleagues. AOL Instant Messenger, with its intuitive, colorful interface, makes messaging easy. The program lets you track who's online—and warn or block anyone bothering you—and it enables group chats in addition to one-on-one communication.—*EM*



America Online Inc.,

www.aol.com/aim.

Dial-Up Magic 1.7

1.2MB • 14 days free trial, then \$10

★★★★

Tired of building Dial-Up Networking connections by hand? Dial-Up Magic exports your connections to a file so you can import them to another computer; it optionally saves phone numbers and passwords. The program lets you easily clone existing connections.—*EM*

TechMagic LLC,

www.techmagic.com.

Spam Exterminator 3.2f

1.5MB • 30 days free trial, then \$27.95

★★★★

Using a continually updated list of known spammers to filter mail before it reaches you, Spam Exterminator works much like a mail-checker, but with options to block known spam and messages with subject headers typically

found in spam.—*EM*

Unisyn Software LLC,

www.unisyn.com.

ORGANIZATIONAL TOOLS

TraxTime 3.2

2.3MB • Free evaluation doesn't expire; \$19.50 license

★★★★★

If you bill time or track efficiency or project profitability, TraxTime is an ideal utility. Using a time-clock metaphor, the tool lets you punch in and out of an unlimited number of projects, with or without accompanying memos. You can then create reports detailing time allocations by project or specified period.—*JO*

Spud City Software Co.,

www.spudcity.com.

Password Keeper for Windows 4.6

146K • 30 days free trial, then \$20

★★★★

Between news sites, e-mail accounts, travel sites, and bank and investment accounts, we all have too many user names and passwords to remember. Password Keeper for Windows stores up to 1,000 records in a password-protected, encrypted format, enabling fast and easy retrieval.—*JO*

Gregory Braun,

www.execpc.com/~sbd.

ESSENTIALS

All the downloads in this roundup will enhance your computing experience. The following, however, are downloads we consider absolutely essential for every computer system.

WinZip
www.winzip.com

RealPlayer 2.0
www.real.com

Shockwave
www.macromedia.com/shockwave

Adobe Acrobat Reader
www.adobe.com

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MONEY.

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- 40X Max™ Variable CD-ROM Drive
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- Altec Lansing ACS-295 Speakers with Subwoofer
- MS® IntelliMouse®
- ★ Iomega Zip 100MB Internal Drive with Two Cartridges, add \$99.
- ★ Upgrade to 3-Year On-site[®] Service, add \$99.

\$3179

Business Lease[®]: \$120/Mo., 36 Mos.
Order Code #591205

DELL DIMENSION XPS R450 PENTIUM II PROCESSOR AT 450MHz

- 128MB 100MHz SDRAM
- 512KB Integrated L2 Cache
- 14.4GB Ultra ATA Hard Drive (7200 rpm)
- NEW 19" (18.0" viewable, .26dp) Trinitron® P990 Monitor
- NEW 16MB STB nVidia TNT 3D AGP Graphics Card
- 40X Max™ Variable CD-ROM Drive
- Crystal 3D 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- MS IntelliMouse
- ★ Upgrade to a NEW 21" (20.0" viewable, .26dp) M1110 Monitor, add \$119.
- ★ Upgrade to a 4.8X DVD-ROM Drive and Decoder Card, add \$139.

\$2479

Business Lease[®]: \$94/Mo., 36 Mos.
Order Code #591202

DELL DIMENSION XPS R450 PENTIUM II PROCESSOR AT 450MHz

- 128MB 100MHz SDRAM
- 512KB Integrated L2 Cache
- NEW 12.9GB Ultra ATA Hard Drive
- 17" (15.9" viewable) 1000LS Monitor
- 8MB STB nVidia 3D AGP Graphics Card
- 40X Max™ Variable CD-ROM Drive
- Crystal 3D 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- MS IntelliMouse
- ★ Upgrade to a NEW 17.2GB Ultra ATA Hard Drive, add \$159.
- ★ Upgrade to a 17" (16.0" viewable, .26dp) Trinitron 1000HS Monitor, add \$99.

\$1999

Business Lease[®]: \$76/Mo., 36 Mos.
Order Code #591209

DELL DIMENSION XPS R400 PENTIUM II PROCESSOR AT 400MHz

- 96MB 100MHz SDRAM
- 512KB Integrated L2 Cache
- NEW 12.9GB Ultra ATA Hard Drive
- 17" (15.9" viewable) 1000LS Monitor
- 8MB ATI XPERT 98D 3D AGP Graphics Card
- 40X Max™ Variable CD-ROM Drive
- Crystal 3D 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- 3Com® 3C905B 10/100 NIC
- MS IntelliMouse
- ★ Upgrade to 128MB 100MHz SDRAM, add \$60.
- ★ Iomega Zip 100MB Internal Drive with Two Cartridges, add \$99.

\$1799

Business Lease[®]: \$68/Mo., 36 Mos.
Order Code #591207

DELL DIMENSION V350 PENTIUM II PROCESSOR AT 350MHz

- 64MB 100MHz SDRAM
- 512KB Integrated L2 Cache
- 8.4GB Ultra ATA Hard Drive
- 17" (15.9" viewable) 1000LS Monitor
- ATI 8MB 3D AGP Graphics
- 40X Max™ Variable CD-ROM Drive
- Yamaha XG 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- NEW 3Com USRobotics V.90[™] PCI Telephony WinModem
- 30-Day Trial Offer ConnectDirect[™] Internet Access[®]
- Iomega Zip 100MB Internal Drive with One Cartridge
- Logitech First Mouse+ Wheel (PS/2v)

\$1599

Business Lease[®]: \$61/Mo., 36 Mos.
Order Code #591216

DELL DIMENSION V333c INTEL® CELERON™ PROCESSOR AT 333MHz

- Network-Designed Desktop**
- 32MB SDRAM
 - 128KB Integrated L2 Cache
 - 8.4GB Ultra ATA Hard Drive
 - 15" (13.7" viewable) 800F Monitor
 - ATI 8MB 3D AGP Graphics
 - 32X Max[™] Variable CD-ROM Drive
 - Integrated Intel 10/100 Ethernet Controller
 - Logitech First Mouse+ Wheel (PS/2v)
 - ★ Upgrade to 96MB SDRAM, add \$89.
 - ★ Upgrade to a 17" (15.9" viewable) 1000LS Monitor, add \$69.
 - ★ Upgrade to a NEW 12.9GB Ultra ATA Hard Drive, add \$89.

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Business Lease[®]: \$45/Mo., 36 Mos.
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- McAfee VirusScan
- Microsoft Windows® 98
- Dell QuietKey® Keyboard
- 3-Year Limited Warranty†
- 1-Year On-site[®] Service

POWER UPGRADES

- Iomega Zip 100MB Internal Drive with Two Cartridges, add \$99.
- NEW 3Com USRobotics V.90[™] PCI Telephony WinModem, add \$49.
- 3Com USRobotics V.90[™] Modem, add \$99.
- Intuit QuickBooks v6.0, add \$118.
- 3-Year On-site[®] Service, add \$99.

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- Three-time "A" rating in PC Magazine Readers' Choice Awards for Service and Reliability.
- Received the highest "Buy Again" ratings from Windows Magazine's 1998 Tech Support Survey.

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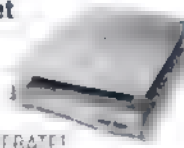
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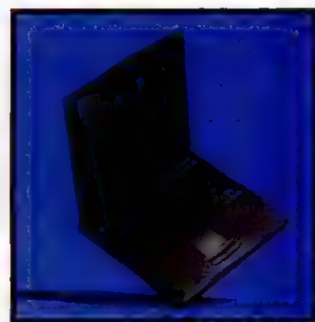
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- 3D Surround Sound and Hardware Wavetable
- Intelligent Lithium Ion Battery
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- 32MB SDRAM (384MB Max*)
- 4GB Ultra ATA Hard Drive
- Removable Combo 24X Max^{AA} Variable CD-ROM and 3.5" Floppy Drive
- 2X AGP 4MB ATI Rage Pro 3D Video
- 3D Surround Sound and Hardware Wavetable
- Intelligent Lithium Ion Battery
- Deluxe Nylon Case
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- Microsoft Windows 98/Touchpad
- 3-Year Limited Warranty†
- ★ Upgrade to 96MB SDRAM, add \$199.

\$2699

Business Lease*: \$102/Mo., 36 Mos.
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DELL INSPIRON 7000 D266GT PENTIUM II PROCESSOR AT 266MHz FEATURING MMX TECHNOLOGY

All-in-One Multimedia Performance

- 14.1" XGA Active Matrix Display
- 32MB SDRAM (384MB Max*)
- 4GB Ultra ATA Hard Drive
- Removable Combo 24X Max^{AA} Variable CD-ROM and 3.5" Floppy Drive
- 2X AGP 4MB ATI Rage Pro 3D Video
- 3D Surround Sound and Hardware Wavetable
- Intelligent Lithium Ion Battery
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- Microsoft Windows 98/Touchpad
- 3-Year Limited Warranty†
- ★ Upgrade to 96MB SDRAM, add \$199.

\$2399

Business Lease*: \$91/Mo., 36 Mos.
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NEW DELL INSPIRON 3500 D266GT PENTIUM II PROCESSOR AT 266MHz FEATURING MMX TECHNOLOGY

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- 32MB SDRAM (256MB Max)
- 3.2GB Ultra ATA Hard Drive
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- Modular 3.5" Floppy Drive
- NeoMagic MediaMagic 256AV AGP Video
- 3D Surround Sound and Software Wavetable
- Intelligent Lithium Ion Battery
- Deluxe Nylon Case
- Microsoft Office 97 Small Business Edition v2.0
- Microsoft Windows 98/Touchpad
- 3-Year Limited Warranty†

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Business Lease*: \$87/Mo., 36 Mos.
Order Code #891205

NEW DELL INSPIRON 3500 D233XT PENTIUM II PROCESSOR AT 233MHz FEATURING MMX TECHNOLOGY

Light Weight, Light Price

- 13.3" XGA Active Matrix Display
- 32MB SDRAM (256MB Max)
- 3.2GB Ultra ATA Hard Drive
- Modular 24X Max^{AA} Variable CD-ROM
- Modular 3.5" Floppy Drive
- NeoMagic MediaMagic 256AV AGP Video
- 3D Surround Sound and Software Wavetable
- Intelligent Lithium Ion Battery
- Microsoft Office 97 Small Business Edition v2.0
- Microsoft Windows 98/Touchpad
- 3-Year Limited Warranty†
- ★ Upgrade to 64MB SDRAM, add \$99.

\$1999

Business Lease*: \$76/Mo., 36 Mos.
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DELL LATITUDE CPi D300XT PENTIUM II PROCESSOR AT 300MHz FEATURING MMX TECHNOLOGY

Network Optimized

- 13.3" XGA Active Matrix Display
- 64MB EDO RAM
- 4GB Ultra ATA Hard Drive
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- Modular 3.5" Floppy Drive
- NeoMagic 128-bit Graphics Accelerator
- 3D Surround Sound and Software Wavetable
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- Touchpad
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Business Lease*: \$114/Mo., 36 Mos.
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DELL LATITUDE CP D233ST PENTIUM PROCESSOR WITH MMX TECHNOLOGY AT 233MHz

Network Optimized

- 12.1" SVGA Active Matrix Display
- 32MB EDO RAM
- 4GB Ultra ATA Hard Drive
- Modular 20X Max^{AA} Variable CD-ROM
- Modular 3.5" Floppy Drive
- NeoMagic 128-bit Graphics Accelerator
- 3D Surround Sound and Software Wavetable
- Intelligent Lithium Ion Battery with ExpressCharge Technology
- MS Windows NT Workstation 4.0
- Touchpad
- 3-Year Limited Warranty†
- 1-Year On-site^A Service

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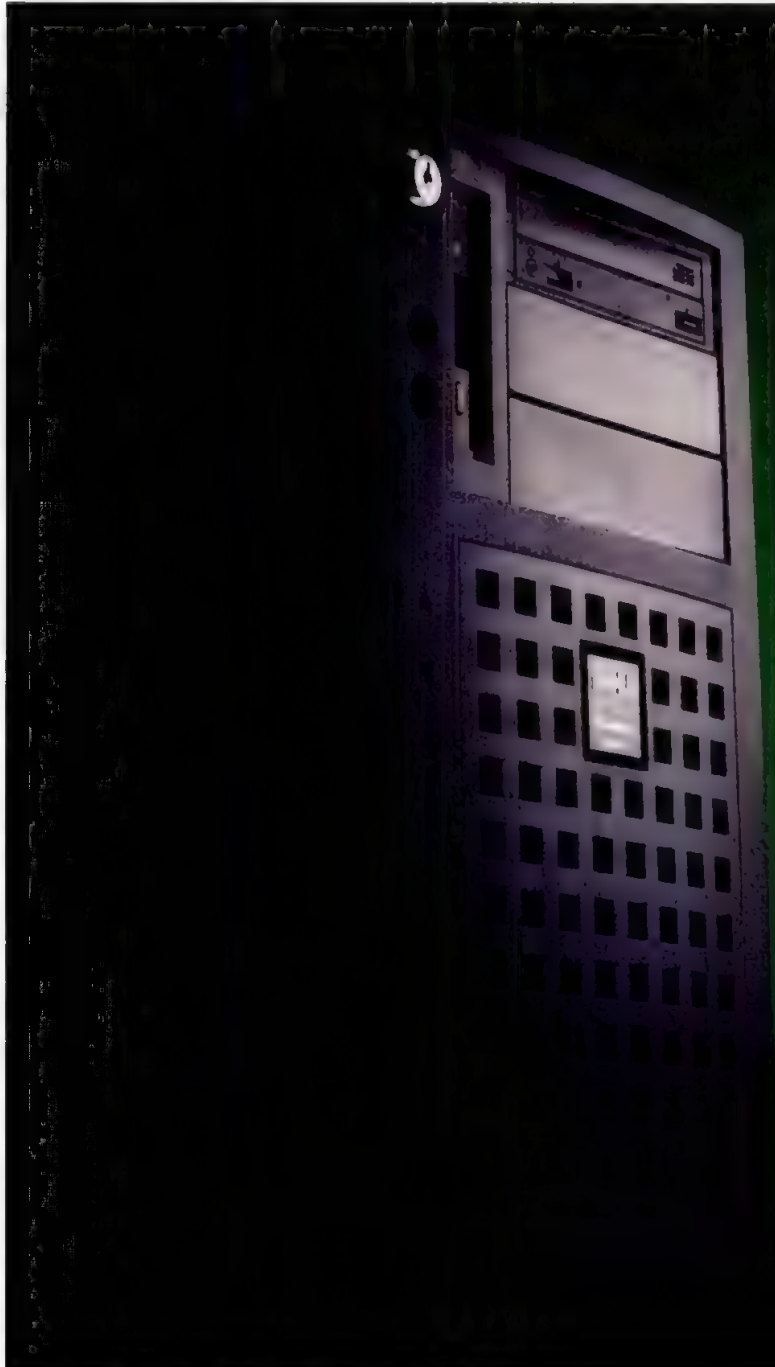
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- 32X Max[®] Variable SCSI CD-ROM Drive
- HP OpenView NNM Special Edition
- Intel Pro/100B PCI Ethernet Adapter
- Integrated Ultra-2/LVD and Ultra/Narrow SCSI Controllers
- 6 Expansion Slots: 4 PCI, 2 PCI/ISA
- 6-1" Hard Drive Bays
- 3 External 5.25" Drive Bays plus Dedicated 3.5" Floppy Drive Bay
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- 7x24 Server Hardware Technical Support
- ★ Upgrade to 256MB 100MHz ECC SDRAM, add \$389.

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DELL POWEREDGE 4300 SERVER PENTIUM II PROCESSOR AT 450MHz (DUAL PROCESSOR/RAID CAPABLE)

- 128MB 100MHz ECC SDRAM
- 512KB Integrated L2 ECC Cache
- 18GB Ultra-2/LVD SCSI Hard Drive (Hot-Swap Optional)
- 32X Max[®] Variable SCSI CD-ROM Drive
- HP OpenView NNM Special Edition
- Intel Pro/100+ PCI Ethernet Adapter
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- Redundant Hot-Pluggable Power Supplies, Cooling Fans and Processor Fans
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DELL POWEREDGE 4300 SERVER DUAL PENTIUM II PROCESSORS AT 350MHz (DUAL PROCESSOR/RAID 5 CONFIGURATION)

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- 512KB Integrated L2 ECC Cache
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- Ultra-2/LVD PowerEdge Expandable RAID Controller 2/SC
- 32X Max[®] Variable SCSI CD-ROM Drive
- HP OpenView NNM Special Edition
- Intel Pro/100+ PCI Ethernet Adapter
- Integrated Ultra-2/LVD and Ultra/Narrow SCSI Controllers
- Redundant Hot-Pluggable Power Supplies, Cooling Fans and Processor Fans
- 6 Expansion Slots: 4 PCI, 2 PCI/ISA
- 10 Drive Bays: 6 Drive Bays, 4 Removable Media Bays
- 3-Year NBD On-site[®] Service
- 7x24 Server Hardware Technical Support

\$7449

Business Lease[®]: \$270/Mo., 36 Mos.
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DELL POWEREDGE 6300 SERVER PENTIUM II XEON™ PROCESSOR AT 400MHz (QUAD PROCESSOR CAPABLE)

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- 512KB Integrated L2 Cache per Processor
- Three 9GB Ultra-2/LVD SCSI Hot-Swap Hard Drives
- Dual Channel PowerEdge Expandable RAID Controller
- Triple Peer PCI Bus
- 32X Max[®] Variable SCSI CD-ROM Drive
- HP OpenView NNM Special Edition
- Intel Pro/100+ PCI Ethernet Adapter
- Integrated Dual Ultra-2/LVD and Ultra/Narrow SCSI Controllers
- Redundant Hot-Pluggable Power Supplies, Cooling Fans and Processor Fans
- 7 Expansion Slots: (4) 64-bit, (3) 32-bit PCI
- 10 Drive Bays: 6 Drive Bays, 4 Removable Media Bays
- 3-Year NBD On-site[®] Service
- 7x24 Server Hardware Technical Support

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DELL SERVER AWARD INFO

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- Computer Shopper "Top 100" – Dell PowerEdge 2300.

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- 4GB Ultra-2/LVD SCSI Hard Drive
- 17" (15.9" viewable) 1000LS Monitor
- Diamond 8MB AGP Graphics Card
- 32X Max' Variable CD-ROM Drive
- Sound Blaster Pro Compatible Sound
- harman/kardon HK-195 Speakers
- 3Com Fast EtherLink XL 10/100 PCI Network Interface
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- **MS Windows NT 4.0 and 1-Year NT Telephone Support**
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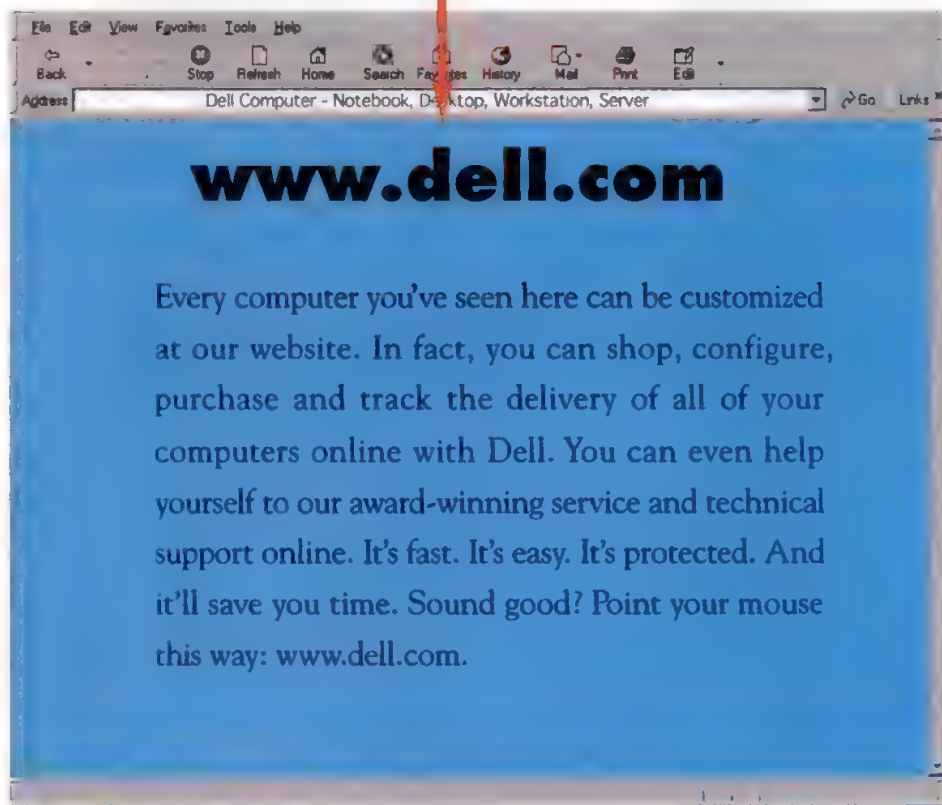
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Calendar '99 2.6

532K • 30 days free trial, then \$15 downloaded; on-disk, \$17 by credit card or \$20 by check

★★★

A simple program for creating and printing monthly or bi-weekly calendars, Calendar '99 is ideal for busy families or small offices. The calendar includes holidays, moon phases, and time changes. You can add one-time events and weekly, monthly, or yearly occurrences.—JO

Joel Graffman,
members.aol.com/jgraff.

Post-it Software Notes 1.5

1.5MB • 30 days limited trial, then \$17.99 downloaded, \$24.95 on-disk

★★★

Simplicity and utility were key to 3M's paper Post-it notes, a formula that's been carried over to the software version. Click on a floating panel to create a new note for embedding into OLE client applications or e-mail messages. Or you can arrange notes on topic-specific memo boards such as "projects" or "clients."—JO

3M Corp.,
www.mmm.com.

Reminder 4.68

532K Free, \$20.00 registration for upgrades

★★★★

With its great balance between simplicity and functionality, Reminder is an activity manager that even newbies can master. You enter task descriptions with due dates, warning periods, and frequencies of display in a list, calendar, or printout. When you launch Windows, Reminder displays all daily tasks plus warnings of future events.—JO

Agency Computer Solutions,
www.agenda.dircon.co.uk.

WEB DEVELOPMENT TOOLS

RCedit 0.9.99

4.1MB • Free

★★★★★

Unlike some text-based HTML editors, RCedit does not require you to have a computer science degree to use it. A set of wizards and assistants help you add tables, images, links, and even scripts—all without having to write HTML. Drop-

If you build your Web pages on a nice high-resolution monitor, you'll be sure to get nasty e-mail about pages that look terrible at lower resolutions. BrowserSizer configures Internet Explorer or Navigator in 640-by-480, 800-by-600, 1,024-by-768, or WebTV-appropriate resolution so you can preview your pages. Click on a resolution target and your browser instantly resizes and reloads the page.—JM



down boxes let you assign header, font, and size attributes to text.—Jay Munro

Robert Chapman,
www.igs.net/~robc/rceditinfo.html.

Cupertino 1998-10-10

769K • Free

★★★★★

If you maintain a Web site or just download files from FTP sites, Cupertino is a must-have. An easy-to-use FTP client with a drag-and-drop Windows Explorer look, Cupertino lets you copy or move files to your hard disk or even between FTP sites.—JM

H. Sean Hu,
members.xoom.com/seanhu.

BrowserSizer 1.02

895K • Unlimited trial period, price: one uncanceled stamp

★★★★★

Racecar,
www.vasile.com/racecar/stampware.

AddWeb 2.47

1.5MB • Trial version (10 submissions), free; full version, \$49

★★★

You must submit... your Web site to search engines to get traffic, and AddWeb gives you an easy and powerful way to do it. Enter your site's URL, title, and description, as well as up to 15 keywords, then pick your target engines (over 450 included) and submit. The cool progress page shows you which engines successfully registered you and which did not. The trial version lets you submit only to major search engines and use the ranking feature ten times.—JM

Cyberspace Information Systems,
www.cyberspacehq.com.

GAMES

Free Solitaire 2.03

1.1MB • Free

★★★

If playing cards solo is your game, then the eight solitaire variants found in Free Solitaire will keep you occupied for quite some time. Though far from fancy, this package more than lived up to its modest billing, with mutant solitaire versions such as Sea Towers and Spider.—Sarah L. Roberts-Witt

Michael McCulloch and Goodsol Development,
www.goodsol.com/freesol.

Age of Empires 1.0

23.6MB • Free one-campaign trial

★★★★★

A grueling strategy game, Age of Empires is replete with stunning graphics and sophisticated situations. The demo version gives you unlimited access to one campaign, part of which includes destroying the Greek government. The thrill and challenge of the game lie in

teaching the necessary takeover skills to the troops at your disposal. The demo gives you access to tips, help, and game overviews.—SLR

Microsoft Corp.,
www.microsoft.com/games/empires.

Kyodai 6.21a

9.2MB • Free evaluation, \$22.95 license

★★★

For those enamored with the ancient fun of mah-jongg, Kyodai is a top-notch package for beginning to advanced players. It provides a total of nine play options for varying skill levels, and it permits multiplayer games. The program lets you modify the music and the board layout.—SLR

Rene-Gilles Deberdt,
namida.animanga.com/kyodai.html



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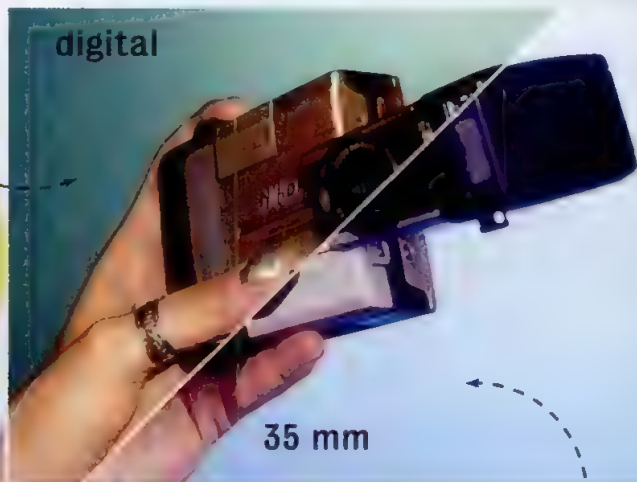
in this review The 20 digital cameras PC Magazine Labs tested fall roughly into three subsets: those meant for home use, those targeted at business users, and those good enough for semipro photographers.

	PAGE	PRICE	HOME	BUSINESS	SEMIPRO
Agfa ePhoto 700	128	\$300 street	Good	Fair	Poor
Agfa ePhoto 1680	125	\$300 street	Fair	Good	Excellent
Casio QV-7000SK	125	\$700 street	Fair	Excellent	Fair
Eastman Kodak DC210 Plus	125	\$450 list	Good	Good	Fair
Eastman Kodak DC260	125	\$850 list	Fair	Good	Excellent

	PAGE	PRICE	HOME	BUSINESS	SEMIPRO
Epson PhotoPC 700	128	\$600 street	Good	Excellent	Fair
Fujifilm MX-500	128	\$500 street	Excellent	Excellent	Good
Fujifilm MX-700	128	\$800 street	Fair	Excellent	Good
HP PhotoSmart C30	131	\$400 street	Excellent	Good	Fair
Konica Q-M100	131	\$900 street	Good	Excellent	Excellent

digital is catching up

In years past, a sub-\$1,000 digital camera didn't offer the resolution or color fidelity to replace a film camera. But as this comparison shows, new high-resolution entries are closing the gap between film and digital images.



The upper part of this photo was taken with an Eastman Kodak DC260 (\$899 list), the highest-resolution camera we tested (1.8 megapixels); the bottom, with 35-mm film.

By Daniel Grotta and Sally Wiener Grotta

If you haven't been impressed by the image quality of a digital camera, you haven't seen the newest generation of affordable, high-resolution contenders. Last year, a \$500 entry-level digital camera delivered only 640-by-480 resolution—good enough for a 4- by 6-inch print that no one would mistake for a real photo. The same investment today nets you a 1,280-by-1,024 camera whose 5-by 7-inch prints are nearly indistinguishable from traditional film-based photos.

[illegible]

editors' choice

- Business: Sony MVC-FD81
- Semipro: Nikon Coolpix 900s
- Home: HP PhotoSmart C30



Our tests yielded three clear leaders in image quality and features from the 20 cameras we reviewed—one to fit each user and budget.

For business users, our Editors' Choice is the Sony MVC-FD81 (\$800 street). Its real selling point is convenient floppy disk storage, which lets you easily transfer images to any desktop or laptop PC or hand off images to clients and colleagues. No adapters, no extra hardware, and no worrying about lending out costly miniature flash memory media. That would have been enough to satisfy us, but Sony has gone further: The unit lets you save low-res video clips—of sufficiently high quality and space efficiency for Web posting or attaching to an e-mail—to that floppy disk. Also, the battery life is commendable, and the Solar Window feature means the LCD screen can be seen even in bright light. The drawback is image quality: Sony's aggressive compression algorithms to enable floppy disk storage degrade the images somewhat. Still, our jury found the MVC-FD81's pictures acceptable, and the other features make this camera the right choice for business users who are willing to trade some image quality for convenience. An honorable mention in this

category goes to the Epson PhotoPC 700 (\$600 street). It's less expensive than the Sony, and our jury far preferred its images.

For higher-end users who need uncompromising image quality, our Editors' Choice is the Nikon Coolpix 900s (\$800 street). Pictures were sharp, with accurate, well-balanced colors. Our jury placed the Coolpix's images first for both printed output and Web display. The camera's automatic mode is easy to use and yielded fine results, and the Coolpix offers full manual control for advanced users who want to set parameters themselves. Nikon also offers add-on lenses, including wide-angle (\$100) and fish-eye (\$200). A close runner-up to the Nikon is the Eastman Kodak DC260 (\$899 list), which merits honorable mention. Its photos were also top-notch, and the Kodak's greater resolution (1.6 megapixels, versus 1.3 for the Nikon) may make it the better choice if you plan on enlarging images.

For budget-conscious home users looking to get started in digital photography, our Editors' Choice is the HP PhotoSmart C30 (\$400 street). It's easy to learn and use, and it delivers above-average image quality at a very attractive price.



To be included in this roundup, cameras had to deliver:

- **Megapixel resolution.** The strict definition of *megapixel* is 1 one million pixels (or picture elements) per image. But we use the more forgiving definition, one widely used in the industry, whereby at least one dimension in the file you upload and open must be 1,000 pixels or more. So a 1,024-by-768 camera, which technically delivers only 786,432 pixels, still counts as a megapixel unit. Also, we've included the lower-resolution Agfa ePhoto 780 and Sony MVC-FD71 for comparison.
- **Built-in flash.** We've found that digital cameras without flash generally deliver dark, muddy pictures indoors; we would not recommend a camera without one.
- **Removable media.** The first digital cameras made you hassle with cumbersome, slow serial connections to download photos from the camera to your PC. Better

cameras now offer removable storage—miniature flash memory disks, or even (in the case of the Sony Mavica line) floppy disks—to make transfer to a laptop or desktop PC easier.

We also set a price cap of \$1,200. As you approach \$2,000, you're in the rarefied air of professional-caliber cameras for photojournalists and the like—more than a typical business user or photo hobbyist would need or even want. We asked each of the 14 vendors to submit one product from its line (most have several that met our criteria); we allowed the largest vendors in the field to submit a second entry. Canon, Minolta, Panasonic, and Polaroid

were introducing new cameras that were not ready in time for this roundup.

IMAGES FOR EVERY NEED

Digital cameras offer several advantages over conventional film-based cameras. For one, there are no film-processing costs or hassle. Users will also appreciate digital photography's immediacy: In minutes, your images are in your computer, waiting to be posted to a Web site, placed in a presentation, or printed on one of the affordable photo-quality printers now available. And the color LCD screens found on every camera here let you see instantly if a shot is worth keeping or if

Our Contributors: DANIEL GROTTA and SALLY WIENER GROTTA are contributing editors of *PC Magazine* and authors of *Digital Imaging for Visual Artists* (McGraw-Hill). JOHN R. QUAIN and M. DAVID STONE are also contributing editors, and JAMES KARNEY is a frequent contributor. JOSH LEVY is a staff editor on *PC Magazine's* hardware peripherals team. S. JAE YANG was the project leader, and senior associate editor JAMIE M. BSALES was in charge of this story.

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Well, if you own a

Quantex systems feature the Intel® Pentium® II processor



Today, Quantex is one of the world's largest direct marketers of computer systems, featuring the Intel® Pentium® II processor. And in the last year, Quantex has consistently placed at or near the top in surveys of customer satisfaction and tech support. As well as winning dozens of product rating awards in the most respected publications.

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WOULD QUANTEX OWNERS BUY AGAIN? IN A HEARTBEAT*.

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WOULD YOU BUY AGAIN?

Vendor	Based on Reliability	Based on Service
Micron	★★★★★	★★★★★
Quantex	★★★★★	★★★★
Dell	★★★★★	★★★★
Gateway	★★★★	★★★★
IBM	★★★★	★★★
Compaq	★★★	★★★
HP	★★★	★★★
AST	★★	★★
Acer	★	★

Five star is best possible rating, one star, the worst
 "PC World Reliability and Service Survey—Home PCs" Nov '98
 *calculations based on online participants' responses recorded between May 1998 and June 1998

That puts us ahead of some very big names.

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 US BEST—OUR CUSTOMERS.**

In the most recent *PC Magazine* study, PC owners rated Quantex a leader for tech support based on their own experiences. For the technical knowledge of our people and the promptness of the resolution, no one beat Quantex. And no one came within 10 points for "tech tried everything to help." Not Dell. Not Micron.

**COMPUTER
 SHOPPER**
 1997 Direct Channel
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PC COMPUTING
 1997 Most
 Valuable
 Product Award

PC COMPUTING
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 (11/98)

PC COMPUTING
 5 Star Rating
 (10/98)

PC WORLD
 Best Buy Award
 (10/98)

PC WORLD
 Best Buy Award
 (9/98)

PC WORLD
 #1 Best Buy
 Award (8/98)

PC WORLD
 #1 Best Buy
 Award (7/98)

*Results based on a PC World (Nov '98) "Home PCs Reliability and Service Survey" in which Quantex received a 5-Star rating for Buy Again Based on Reliability and 4-Star rating for Buy Again based on Service.
 Buy again based on reliability: Five stars: 96.4 to 95.1%. Four stars: 93.2 to 91%. Three stars: 86.4 to 86%. Two stars: 84.4 to 81.5%. One star: 77.9 to 72.5%.
 Buy again based on service: Five stars: 94.1 to 93.8%. Four stars: 90.4 to 86.1%. Three stars: 82 to 75.6%. Two stars: 73.6 to 70%. One star: 69.3 to 60.1%.

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TECH SUPPORT EXPERIENCE

Vendor	Tech was knowledgeable	Tech tried everything to help	Prompt resolution	Got a run-around
Quantex	57%	59%	49%	9%
Micron	56%	47%	43%	9%
Gateway	54%	48%	45%	10%
Dell	54%	43%	49%	10%
IBM	41%	33%	36%	15%
Compaq	37%	30%	30%	17%
Average*	40%	33%	32%	16%

"Service and Reliability Survey," PC Magazine, July 1998
* calculations based on all 25 PC vendors evaluated in the survey



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PC COMPUTING
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Survivor (4/98)

PC COMPUTING
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(9/98)

Results based on PC Magazine (July '98) "Service and Reliability Survey" in which Quantex received the highest ratings for its customers' "Tech Support Experience" in 4 out of 5 categories including 'tech was knowledgeable, tech tried everything to help, prompt resolution and got a run-around.' Calculations based on 25 vendors evaluated in the survey.



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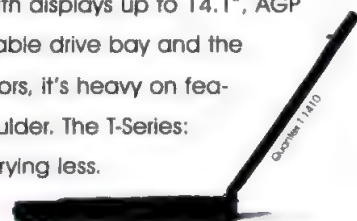
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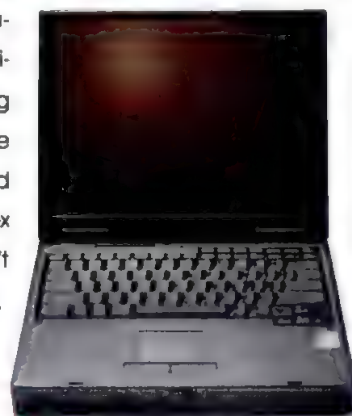
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- New NeoMagic NMGS 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- Mini-Docking Station
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

Quantex T-1410 \$2699

Business lease: \$94/Mo.

- Pentium® II processor 300MHz
- New Ultra-Thin Design (12.44"x9.84"x1.43")
- 14.1" XGA Active Matrix Display
- 80MB SDRAM / 512KB Secondary Cache
- 6GB Ultra ATA HD
- 56K V.90 Fax/Modem*
- New 2X Modular DVD-ROM Drive & 3.5" Floppy Drive
- New NeoMagic NMGS 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98
- Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

Quantex T-1411 \$2899

Business lease: \$101/Mo.

- Pentium® II Processor 300MHz
- New Ultra-Thin Design (12.44"x9.84"x1.43")
- 14.1" XGA Active Matrix Display
- 96MB SDRAM / 512KB Secondary Cache
- 6GB Ultra ATA HD
- 56K V.90 Fax/Modem*
- New 2X Modular DVD-ROM Drive & 3.5" Floppy Drive
- New NeoMagic NMGS 128-bit AGP Video
- Integrated 16-bit Stereo Sound and Speakers
- Two Smart Lithium Ion Batteries
- Mini-Docking Station
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

Quantex I-1400 \$2199

Business lease: \$77/Mo.

- Pentium® II processor 266MHz
- 14.1" XGA Active Matrix Display
- 64MB SDRAM / 512KB Secondary Cache
- 4GB Ultra ATA HD
- 56K V.90 Fax/Modem*
- Removable 24X CD-ROM Drive & 3.5" Floppy Drive
- New ATI Rage Lt Pro 3D AGP Video w/8MB
- New ESS 3D Wavetable Surround Sound and Speakers
- New Long-Lasting 12-Cell Smart Lithium Ion Battery
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Corel Office Suite 8
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

Quantex I-1411 \$3299

Business lease: \$110/Mo.

- Pentium® II Processor 300MHz
- 14.1" XGA Active Matrix Display
- 128MB SDRAM / 512KB Secondary Cache
- 8GB Ultra ATA HD
- 56K V.90 Fax/Modem*
- New Removable 2X DVD-ROM Drive & 3.5" Floppy Drive
- New ATI Rage Lt Pro 3D AGP Video w/8MB
- New ESS 3D Wavetable Surround Sound and Speakers
- New Two Long-Lasting 12-Cell Smart Lithium Ion Batteries
- Mini-Docking Station
- USB and Fast IR Ports / Integrated Personal Touchpad
- MS Windows 98 / Microsoft Office 97 SBE v2.0
- Quantex Carrying Case
- Year 2000 Compatible
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

I-1400 w/Pentium II processor 300MHz.....\$2499

I-1411 w/Pentium II processor 266MHz.....\$3099



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VALUE MULTIMEDIA

QP6/333 M-1c \$1099

Business lease: \$39/Mo.

- Intel® Celeron® Processor 333MHz
- 64MB SDRAM Memory / 128KB Secondary Cache
- 6 GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 15" Digital Monitor (13.8" viewable)
- 64-Bit 3D AGP Graphics Accelerator with 4MB
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max Variable Speed CD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98 / Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/333 M-1x (with Pentium II processor).....	\$1149
QP6/350 M-1x (with Pentium II processor).....	\$1199
QP6/350 M-1xw (with Pentium II processor, 17" Monitor, and Intel740 3D 2X AGP Graphics w/8MB).....	\$1299

SOFTWARE: Corel Office Suite 6 • Internet the Cry • Compton's Interactive Encyclopedia • Body Works 6.0 • Amazon Trail II • MS Money '97 (pre-loaded only) • American Heritage Talking Dictionary • Dr. Solomons Find-Virus (pre-loaded only) • Compton's Reference Collection • MS Internet Explorer 4.0

QP6/350 M-2x \$1399

Business lease: \$49/Mo.

- Pentium® II Processor 350MHz/100MHz Front Side Bus
- 64MB SDRAM Memory / 512KB Secondary Cache
- 8 GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Upgrade to 17" Monitor w/NEC ChromaClear CRT for \$79
- Toshiba MPACT2 3D Media Accelerator w/8MB VRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/400 M-2x (with Pentium II processor).....	\$1549
QP6/450 M-2x (with Pentium II processor).....	\$1749

QP6/400 M-3x \$1649

Business lease: \$58/Mo.

- Pentium® II Processor 400MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 10 GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Upgrade to 17" Monitor w/NEC ChromaClear CRT for \$79
- Toshiba MPACT2 3D Media Accelerator w/8MB VRAM
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/350 M-3x (with Pentium II processor).....	\$1499
QP6/450 M-3x (with Pentium II processor).....	\$1849

QP6/450 M-4x \$1999

Business lease: \$70/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 96MB PC100 SDRAM Memory/512KB Secondary Cache
- 10 GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- Intel740® 3D 2X AGP Graphics with 8MB SDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Add Altec Lansing ACS-251 Subwoofer for \$39

QP6/350 M-4x (with Pentium II processor).....	\$1649
QP6/400 M-4x (with Pentium II processor).....	\$1799

POWER MULTIMEDIA

QP6/350 SM-1x \$1199

Business lease: \$51/Mo.

- Pentium® II Processor 350MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Upgrade to 17" Monitor w/NEC ChromaClear CRT for \$79
- Intel740® 3D 2X AGP Graphics with 8MB SDRAM
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- 32X Max Variable Speed CD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-45 1 PowerCube Speakers w/subwoofer
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS IntelliMouse
- MS Windows 98
- Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/400 SM-1x (with Pentium II processor).....	\$1599
QP6/400 SM-1xw (with Pentium II processor, 10.26GB HD, and 3rd-Generation 4.8X DVD-ROM Drive).....	\$1699

SOFTWARE: MS Office '97 Small Business Edition v2.0 • MS Money '97 (pre-loaded only) • Office Mate • Day Planner Pro • Power Business Plans • Form Designer Pro • Project Manager Pro • Labels Unlimited • Compton's Reference Collection • Dr. Solomons Find-Virus (pre-loaded only) • MS Internet Explorer 4.0

QP6/400 SM-2x \$1799

Business lease: \$63/Mo.

- Pentium® II Processor 400MHz/100MHz Front Side Bus
- 96MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 17" Digital Monitor w/OSD (15.8" viewable)
- Upgrade to 17" Monitor w/NEC ChromaClear CRT for \$79
- New 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB
- Based on award-winning Voodoo2 3D Technology
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-45 1 PowerCube Speakers w/subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/350 SM-2x (with Pentium II processor).....	\$1649
QP6/450 SM-2x (with Pentium II processor).....	\$1999

QP6/400 SM-3x \$2099

Business lease: \$74/Mo.

- Pentium® II Processor 400MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- New 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB
- Based on award-winning Voodoo2 3D Technology
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-45 1 PowerCube Speakers w/subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Upgrade to #9 Revolution IV AGP Video w/32MB for \$49

QP6/350 SM-3x (with Pentium II processor).....	\$1949
QP6/450 SM-3x (with Pentium II processor).....	\$2299

QP6/450 SM-4x \$2399

Business lease: \$84/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- New 16.8GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- New 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB
- Based on award-winning Voodoo2 3D Technology
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- New Altec-Lansing ADA-305 Dolby Pro Logic Surround Sound Speakers with subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Upgrade to #9 Revolution IV AGP Video w/32MB for \$49

QP6/400 SM-4x (with Pentium II processor).....	\$2199
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SUPER MULTIMEDIA

QP6/450 M-4x SE \$2149

Business lease: \$77/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- Intel740® 3D 2X AGP Graphics with 8MB SDRAM
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-90 Speakers
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Add Altec Lansing ACS-251 Subwoofer for \$39
- Upgrade to 21" Monitor (20.0" viewable) for \$349

QP6/400 M-4x SE (with Pentium II processor).....	\$1949
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QP6/450 SM-4x SE \$2799

Business lease: \$98/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 16.8GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 21" Monitor w/OSD (20.0" viewable), 1600x1200
- New 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB
- Based on award-winning Voodoo2 3D Technology
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- New Altec-Lansing ADA-305 Dolby Pro Logic Surround Sound Speakers with subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98 / Power Multimedia Software Bundle
- Microsoft Office 97 SBE v2.0
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Upgrade to 15.0" LCD Flat-Panel Display for \$149

QP6/400 SM-4x SE (with Pentium II processor).....	\$2599
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M-SERIES BEST BUY

QP6/450 Best Buy \$1999

Business lease: \$70/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 64MB PC100 SDRAM Memory / 512KB Secondary Cache
- 10 GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- New 3Dfx 128-bit Voodoo Banshee 3D AGP Video w/16MB
- Based on award-winning Voodoo2 3D Technology
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-45 1 PowerCube Speakers w/subwoofer
- Quantex ATX Mid Tower Case
- 104-Key Keyboard with MS Mouse
- MS Windows 98
- Value Multimedia Software Bundle
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant
- Add a Internal Zip Drive for \$79

GAMING BEST BUY

QP6/450 GX-2 \$2399

Business lease: \$84/Mo.

- Pentium® II Processor 450MHz/100MHz Front Side Bus
- 128MB PC100 SDRAM Memory / 512KB Secondary Cache
- 13GB Ultra ATA HD / 3.5" 1.44MB Floppy Drive
- 19" Monitor w/OSD (18.1" viewable), 1600x1200, 26dp
- Intel740® 3D 2X AGP Graphics with 8MB SDRAM
- Internal 100MB Zip Drive with one cartridge
- 56K V.90 PCI Fax/Modem* w/Voice Mail and Speakerphone
- New 3rd-Generation 4.8X DVD-ROM Drive
- Aural® "A3D" 3D Positional PCI Sound
- 3Dfx Voodoo2 based 3D Game Accelerator w/12MB
- MS SideWinder Precision Pro Joystick
- New Altec-Lansing ADA-305 Dolby Pro Logic Surround Sound Speakers & subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS Mouse
- MS Windows 98 / Value Multimedia Software Bundle
- Activision Game Titles: Battalion, Heavy Gear Interstate 76 w/Nitro Pack
- 3-year limited warranty with 1-year On-Site Service**
- Year 2000 Compliant

QP6/400 GX-2 (with Pentium II processor).....	\$2199
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Agfa ePhoto 780, ePhoto 1680

ePhoto 780: 1,024 x 768 resolution; SmartMedia removable memory. \$300 street.

ePhoto 1680: 1,600 x 1,200 SmartMedia. \$900 street. Wilmington, MA; 888-281-2302, 978-657-5600; www.agfahome.com; 500 at www.pcmag.com/infolink.

As the least expensive camera in this roundup, the Agfa ePhoto 780 offers few features and has limited image quality. Closely resembling a film-based point-and-shoot camera, the ePhoto 780 fits nicely into your hand, and it's exceptionally easy to operate. There's also scarcely any delay between pressing the shutter release and taking the picture.

With a CCD of only 350,000 pixels, the ePhoto 780 is really a VGA-resolution camera; Agfa's Photo-Genie software automatically boosts resolution to 1,024-by-768. Even with the interpolation, however, we found that images still appeared soft and lacked crisp definition compared with those of a native 1,024-by-768 camera. The ePhoto 780's images ranked near the bottom for printed output with our jury. But its images ranked in

the middle for Web-based images, so if that's your primary outlet, this camera might suffice.

With its 1.3-million-pixel sensor, the Agfa ePhoto 1680 is a true megapixel camera. It's targeted at business users and semiprofessional photographers who want an automatic camera that also allows manual control over settings. The ePhoto 1680 has a swivel zoom lens and an LCD viewfinder bright enough to be visible in sunlight but lacks an optical viewfinder. One nice touch is a graphical progress bar that lets you know when the camera is ready to shoot again.

The ePhoto 1680 scored respectably on our jury tests. Photos were well exposed, sharp, and dense with data. Colors were accurate if slightly muted, with very slight clipping in the shadows.

With its impressive variety of features and numerous options for serious business users and semiprofessional photographers, the ePhoto 1680 is a good choice. But be certain to look at the Eastman Kodak DC260 and Nikon Coolpix 900s, which delivered better image quality on our tests. —*DG and SWG*

Eastman Kodak DC210 Plus, DC260

DC210 Plus: 1,152 x 864; CompactFlash.

\$499 list. DC260: 1,536 x 1,024; CompactFlash. \$899 list. Rochester, NY; 800-235-6325, 716-724-4000; www.kodak.com; 502 at www.pcmag.com/infolink.

These Eastman Kodak digital cameras are both credible choices for most buyers. The DC210 Plus is suitable for consumer and business users on a budget, while the higher-

priced HP and Fuji cameras, which our jury preferred.

The DC260 is bigger than the DC210 Plus, with much the same feel as a 35-mm SLR—including true through-the-lens viewing. Additional features include the ability to record sound annotations for pictures, USB connectivity to download images, and FlashPoint's programmable Digita operating system to execute automated camera scripts. The camera's images were among the best we saw in the



end DC260 offers a high-resolution image that's among the best for the cameras reviewed here.

The DC210 Plus looks, feels, and works like a typical point-and-shoot camera. You may need to consult the manual to decipher all the icons on the status LCD, but built-in menus for setting preferences—from resolution to LCD brightness—are self-explanatory. Image quality for the DC210 Plus was acceptable, with realistic colors and a resolution that allowed for reasonably sharp focus. Its images placed midpack in our jury tests. All told, the DC210 Plus is a reasonable value, but be sure to compare it against the similarly

roundup, with realistic color, sharp focus, and adequate exposure for the background without overexposing the foreground.

Although we didn't run a formal battery life test, the DC260 appeared to be one of the more power-hungry cameras in the batch—thanks in part to the motorized zoom and high-resolution LCD—making rechargeable batteries a must. Despite this limitation, it earns a strong recommendation thanks to the quality of its pictures. But before you buy, be sure to also look at the Nikon Coolpix 900s, which is about the same price and which performed somewhat better on our jury tests. —*M. David Stone*

Casio QV-7000SX

QV-7000SX: CompactFlash. \$399 street. Dover, NJ; 800-435-2581, 973-304-5400; www.casio.com; 501 at www.pcmag.com/infolink.

The Casio QV-7000SX delivers high-quality images and some enticing extras—short video recording and panoramic photos—that may win over business users. Its swivel lens

and compact design make it comfortable to point and shoot. There's no optical viewfinder (a battery-draining drawback), but the 2.5-inch LCD is large enough to frame subjects properly and clearly in all but the brightest outdoor settings.

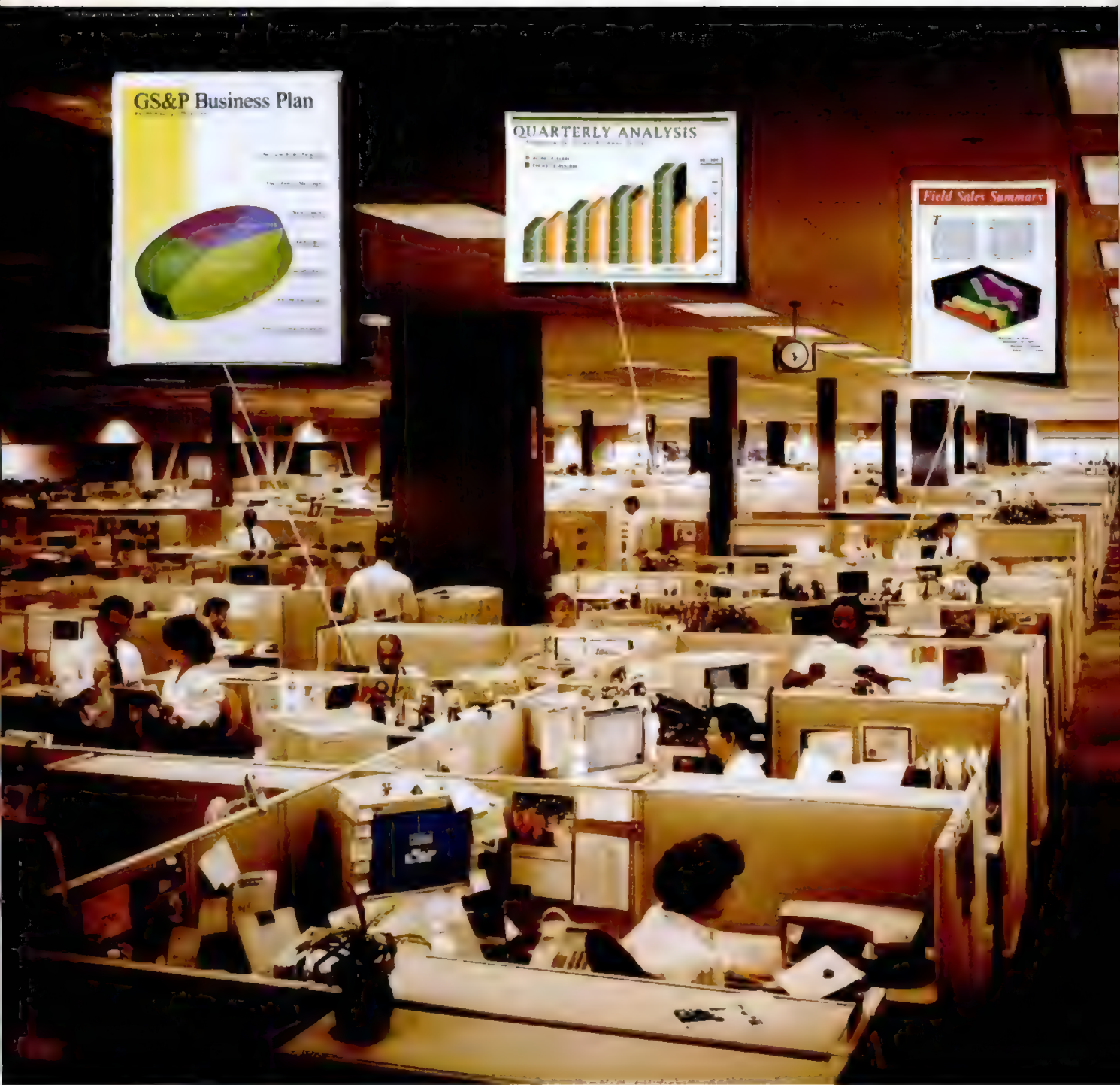
Images are more than satisfactory: Indoors and out, color fidelity was good and pictures were sharp. Our jury rated the QV-7000SX sixth on



both the print and Web jury rankings. Panoramas are easy to create, with the included Spin Panoramas

software matching shots nicely by using a "smart stitch" function. The camera also includes a movie-recording mode for taking video clips of up to 12 seconds. At only 10 fps, however, the clips look jerky. On the whole, the Casio QV-7000SX's image quality won't disappoint, and if you need rudimentary video capabilities from time to time, it's a good bet.

—*John R. Quain*



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Epson PhotoPC 700

1,280 x 960; 4MB internal memory; CompactFlash. \$600 street. Torrance, CA; 800-442-2110; www.epson.com; 503 at www.pcmag.com/infolink.

The Epson PhotoPC 700 is a general-purpose camera whose simplicity and versatility will appeal to families and business users alike. The PhotoPC 700 lets you save images either to internal memory or to removable CompactFlash cards, and it offers several output options, including video-out or direct printing (via a bundled cable) to many Epson Stylus Color and Epson Stylus Photo printers.

Shooting is fast and easy, and both the optical and LCD viewfinders are clear and bright. In automatic mode, the flash works perfectly every time, even with macro shots. But it can be confusing to switch between the various modes and special features. Our test shots were clear, sharp, colorful, and detailed. Except for some loss of detail in dark shadows, the PhotoPC 700 captured scenes accurately. Our jury ranked its images second for Web-based display and a respectable ninth in print. The Epson PhotoPC 700 is a well-rounded device that delivers high-quality images. It should be on your short list, along with the Fujifilm MX-500 and HP PhotoSmart C30. —DG and SWG

Fujifilm MX-500, MX-700; Leica digilux

Fujifilm MX-500: 1,280 x 1,024; SmartMedia. \$500 street. **Fujifilm MX-700:** 1,280 x 1,024; SmartMedia. \$600 street. Elmsford, NY; 800-800-3854, 914-789-8100; www.fujifilm.com; 504 at www.pcmag.com/infolink.

Leica digilux: 1,280 x 1,024; 2MB internal memory; SmartMedia. \$600 street. Northvale, NJ; 800-222-0118, 201-767-7500; www.leica-camera.com; 505 at www.pcmag.com. These three cameras from Fuji Photo Film U.S.A. and Leica Camera are near-clones: All incorporate the same lens, CCD, firmware, and storage system. The inexpensive, family-oriented Fujifilm MX-500 stands out from the pack, however, for its comprehensive range of features, automatic and manual control, and superior image quality at an attractive price. The sleek, upmarket Fujifilm MX-700 and Leica digilux are more compact and lovingly designed, and they're packed with special features for high-end users. To our surprise, however, the MX-500 takes much better photos and costs \$100 less than its counterparts.

The MX-500 is marketed to families and budget-minded business users. Furnished with a run-of-the-mill plastic chassis, it has a smaller LCD viewfinder than its upscale siblings, lacks a control panel, and comes with nonrechargeable batteries. The camera is also somewhat awkward and frustrating to use in real-world shooting conditions. The 1.5-second delay between depressing the shutter and actually capturing an image makes candid and other quickies unfeasible. And without a

control panel, there's no way of seeing how many shots you have left. Shooting frustrations aside, the MX-500 takes excellent pictures. Colors are accurate and avoid exaggeration or oversaturation, and skin tones are generally pleasing. Because the top resolution produces 3.75MB files—larger than those of most cameras in this roundup—there is enough data to generate acceptable 8- by 10-inch prints. Our jury ranked the MX-500's images fifth in printed output and tenth for Web-based shots. The MX-500 is an excellent buy that should please most families and SOHO users, though the similarly priced Epson

perfect traveling companions. The differences between them are the digilux's 2MB of internal memory, as well as its extra leather trim and distinctive red logo. Both units can truly be operated and shot with one hand. But until you've mastered their many features, they can be complicated—even intimidating—to use if you stray from the default settings.

Since they utilize the same core components as the MX-500, we were surprised that the MX-700 and digilux produced significantly inferior images. Their pictures were suitably detailed but exhibited a sallow cast over the entire picture



PhotoPC 700 and HP PhotoSmart C30 are a bit more user-friendly.

The Fujifilm MX-700 and its virtually identical counterpart, the Leica digilux, are gorgeous, ultrasleek instruments that are long on style but short on image quality. The cameras are small and thin enough to fit into a shirt pocket, which makes them

that made colors appear washed out, with no true blacks. Skin tones were slightly reddish, and the highlights were blown out. Our jury ranked their images near the bottom of the pack. For the price, you're better off with the Agfa, Eastman Kodak, or Nikon entries.

—DG and SWG

you need to shoot again.

Until the rise of megapixel cameras, however, there was never any serious quality competition between film-based photography and digital images. In fact, *PC Magazine's* tests in previous years showed that a snapshot from a disposable "film-in-a-box" camera yielded better image quality than the best entry-level digital camera that cost many hundreds of dollars. Not any more. This year, our jury ranked most digital camera images better-looking than

snapshots originally taken with a film camera and scanned with a Visioneer PaperPort OneTouch—a quality, affordable scanner that was an Editors' Choice in our issue of October 20, 1998.

So although 640-by-480 cameras still abound (and are selling well, thanks to recent prices of \$300 or less), we strongly recommend that most users opt for a higher-resolution camera. Simply put, the image quality is an order of magnitude better, thanks to the extra data collected

by the high-density CCD. (The CCD, or *charged-coupled device*, is the electronic chip that gathers data in most digital cameras and scanners.) Arguably the best images we saw in testing were produced by the Eastman Kodak DC260 (\$899 list) and the Nikon Coolpix 900s (\$900 street), which have CCD densities of 1.6 million and 1.3 million pixels, respectively.

Though pixel count and picture size are closely associated, they are not the sole determinants of image quality. Lens and

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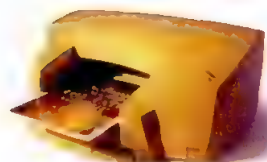
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HP Color LaserJet 8500 Printer Featuring ImageREt Color Layering

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HP PhotoSmart C30



Alto, CA: 800-752-0600, 650-857-1501; www.photosmart.com; 506 at www.pcmag.com/infoclink

The HP PhotoSmart C30 is one of the least expensive megapixel cameras available, and it's a sure bet for home and business users just starting in digital photography. It delivers unsurpassed ease of use and above-average image quality, especially for the price. Manufactured by Konica, it's similar to that company's Q-M100V, also reviewed here. But the PhotoSmart costs \$200 less, and its image quality is better.

The PhotoSmart's boxy styling and slow shooting make it poorly suited to candid and action shots. Taking standard shots is a no-brainer, though: just open the lens, point, and shoot. Controls are clearly marked and arranged intuitively. One weak link: The LCD is jerky, grainy, and virtually impossible to see in bright sunlight.

The camera performs well with or without flash; test images were sharp, detailed, and correctly exposed. Colors were pleasing, if a bit oversaturated. Our jury liked the PhotoSmart, ranking it sixth for screen images and eleventh for printed output—better than more expensive cameras with higher resolutions. If you want to get started in digital photography without committing a lot of cash, this is the camera for you. —DG and SWG



filter set quality also contribute to resolution. Another important factor is the algorithms that help process the image. That's why, despite having the same lens, filters, and CCD, the Fujifilm MX-500 scored so much higher with our jury than did the more expensive Fujifilm MX-700.

IMPROVING EASE OF USE

One task that impedes more widespread use of digital cameras is getting the images from the camera into a computer—and in a

file format that can be opened by just about any graphics program. Many previous models saved files in proprietary formats. This year, all the cameras we tested save images in standard JPEG format that can be opened by any image-editing program.

It used to be that the only way to transfer images was to attach the camera physically to the computer's serial port, hope that the camera was recognized by the software, and then upload the images at a snail's pace. Fortunately, all the cameras in

our roundup can save images to removable media—tiny CompactFlash or SmartMedia flash memory cards—that can be easily uploaded with an adapter that allows them to be accessed like a disk drive (see the sidebar "Image Transfer: Easier than Ever"). The Sony Mavica cameras offer what is probably the ultimate convenience: They save files directly to floppy disks. But there's a tradeoff: To avoid having to change disks every couple of shots, Sony applies more compression to its images



Konica Q-M100V

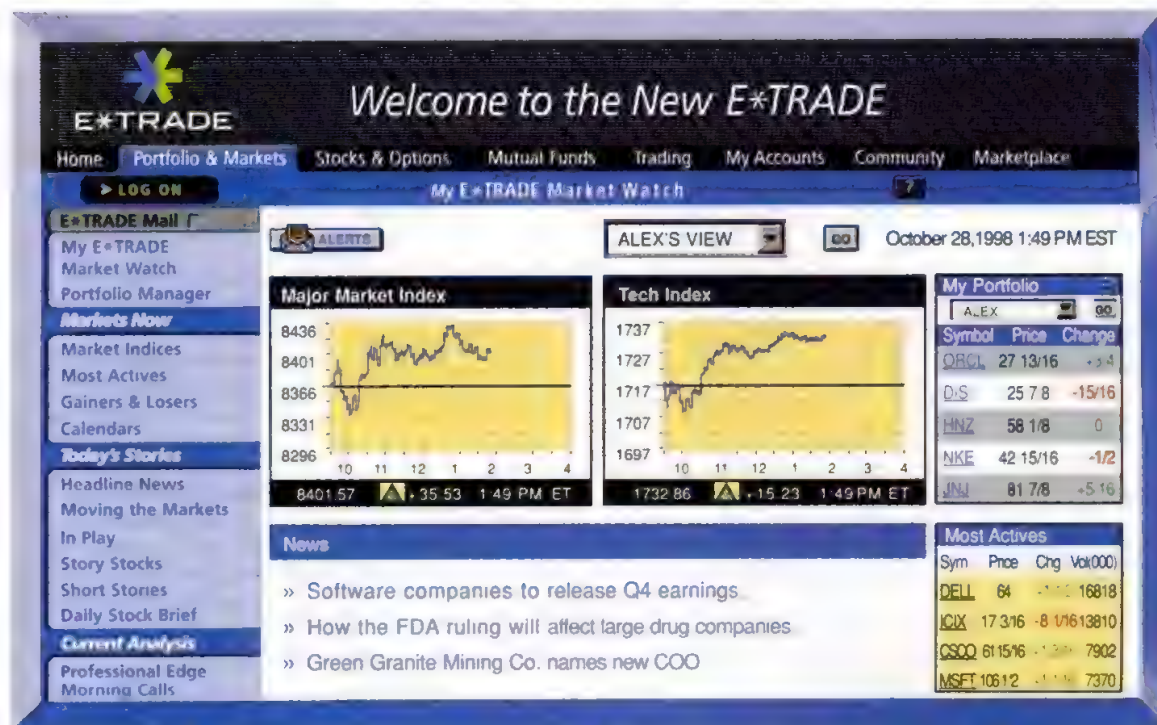
1,152 x 872; 3MB internal memory, CompactFlash. \$600 street. Englewood Cliffs, NJ; 800-756-6422, 201-568-3100; www.konica.com; 507 at www.pcmag.com/infoclink. A decent if somewhat boxy camera, the Konica Q-M100V is almost identical to the HP PhotoSmart C30, also reviewed in this roundup. Both are manufactured by Konica, and both are designed for computer enthusiasts and SOHO users. Each produces good-looking images, but the HP PhotoSmart is \$200 cheaper.

As with the HP unit, the boxy feel and slow shooting capability make the Q-M100V a poor pick for candid and action subjects. Taking point-and-shoot images is easy, though, and the controls are clearly marked and arranged. There are few parameters to select or set. Like the HP's, the Q-M100V's LCD viewfinder is dim, jerky, and grainy, and it significantly distorts the displayed colors. Image quality was good, with pleasing colors. But the Konica's compression software creates images that are less data-intensive than the HP's and hence a bit less sharp.

In the end, the Konica Q-M100V is overshadowed by its almost identical HP twin, which matches it feature for feature but beats it on price and image quality. —DG and SWG

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PERFORMANCE TESTS

Digital Cameras



This year's digital cameras are, on the whole, better than ever for most business uses and for casual outdoor shots. But as in last year's *PC Magazine* roundup, only the very best, most expensive models can compare feature for feature with film cameras.

Our biggest finding is that image quality has improved greatly in the past year. On our jury tests, all of the megapixel-class cameras rated better than nondigital competitors, which included a Kodak PhotoCD image and a standard film print we scanned at 200-dpi resolution using an Editors' Choice-winning Visioneer PaperPort OneTouch scanner. This year's round of testing consisted of three main components: a jury test of on-screen and printed photos, plus two objective measures—one for image sharpness and one for image-processing speed. In the end, the Nikon Coolpix 900s and Eastman Kodak DC260 rose to the top. The Epson PhotoPC 700, the Fujifilm MX-500, and the Casio QV-7000SX also showed impressive image sharpness.

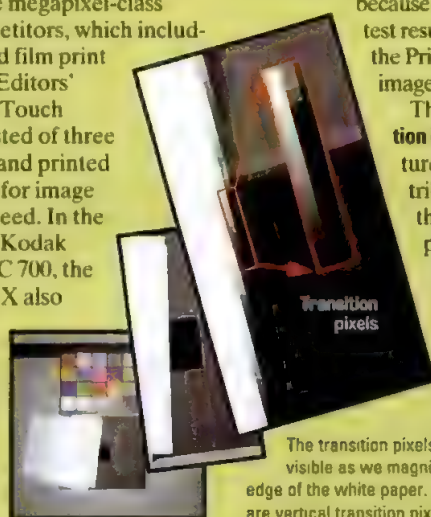
We conducted jury tests for both printed and on-screen images. For the **Print Photo Jury Rank**, jurors looked for the fineness and accuracy of detail, good brightness and contrast, and natural colors one would expect of printed photographs. Since many people use digital cameras to capture

images for posting on HTML pages, for the **Web Photo Jury Rank** we simulated the Web environment and let jurors evaluate the same images reduced to 360-by-480 at 72 dpi on 17-inch monitors (those images are reprinted here). We staged the target scene with a variety of elements that would highlight specific attributes, including optical resolution, color tendencies, and dynamic range. We found that the Print Photo Jury test showed a slightly stronger correlation with the Transition Ratio tests than did the Web Photo Jury test, in which the variation in optical resolving power was made moot by the extensive down-sampling of the original image for on-screen display.

The Nikon Coolpix 900s and Kodak DC260 were the two most preferred cameras overall on our jury tests. The Epson PhotoPC 700 came in second on the Web Photo test, but its too-red color-cast on the print output dropped its print ranking. The Ricoh RDC-4300 and Sanyo VPC-X300 received similar evaluations from the jurors—good on the monitor but below average on the printout because of a red color-cast. The Olympus D-620L's jury test results were the direct opposite: It scored well on the Print Photo Jury test, but on the monitor the image appeared too blue for our jurors.

The **Horizontal Transition Ratio** and **Vertical Transition Ratio** tests indicate a camera's ability to capture details with accuracy; their results can be attributed mainly to the *point-spread function* of the lens, which correlates directly with resolving power. Other contributing factors include the digital and analog signal fidelity in the camera's circuitry, and the level of degradation in the image-compression scheme used. In all cases we used the lowest-compression and highest-quality mode, but it's worth noting that much of the performance measured in

this test is a function of optical accuracy and is therefore not necessarily dependent on the image resolution that vendors



The transition pixels become visible as we magnify the slanted edge of the white paper. Shown here are vertical transition pixels.

TEST RESULTS

▲ High scores are best.
▼ Low scores are best.
Bold type denotes first place.
■ denotes Editors' Choice

	Highest optical resolution	Print Photo Jury Rank ▼	Web Photo Jury Rank ▼	Horizontal Transition Ratio ▼	Vertical Transition Ratio ▼	Burst Mode, LCD on (Images) ▲	Burst Mode, LCD off (Images) ▲
Agfa ePhoto 780*	640 x 480	21	12	27.6%	20.7%	8	10
Agfa ePhoto 1680*	1,280 x 960	7	11	24.7%	24.5%	3	N/A ¹
Casio QV-7000SX	1,280 x 960	6	6	9.3%	13.4%	3	N/A ¹
Eastman Kodak DC210 Plus	1,152 x 864	14	15	14.2%	12.6%	3	3
Eastman Kodak DC260	1,536 x 1,024	2	3	11.1%	13.9%	2	2
Epson PhotoPC 700	1,280 x 960	9	2	10.0%	16.4%	3	3
Fujifilm MX-500	1,280 x 1,024	5	9	9.2%	14.4%	2	3
Fujifilm MX-700	1,280 x 1,024	19	20	25.6%	24.7%	3	3
■ HP PhotoSmart C30	1,152 x 872	11	5	20.0%	18.7%	2	3
Konica Q-M100V	1,152 x 872	10	8	19.9%	23.1%	3	3
Leica digilux	1,280 x 1,024	18	19	51.9%	13.6%	3	4
■ Nikon Coolpix 900s	1,280 x 960	1	1	12.8%	16.3%	4	4
Olympus D-400 Zoom	1,280 x 960	8	17	17.6%	21.4%	4	4
Olympus D-620L	1,280 x 1,024	3	18	16.0%	19.1%	N/A ²	3
Ricoh RDC-4200	1,280 x 960	4	14	17.5%	18.1%	2	N/A ¹
Ricoh RDC-4300	1,280 x 960	16	7	11.3%	16.7%	2	N/A ¹
Sanyo VPC-X300	1,024 x 768	17	4	14.6%	21.7%	3	4
Sony MVC-FD71	640 x 480	22	21	70.4%	44.8%	6	6
■ Sony MVC-FD81	1,024 x 768	12	16	15.2%	13.3%	5	5
Toshiba PDR-M1	1,280 x 1,024	13	13	27.5%	26.8%	2	2
Film Image on Photo CD	—	15	10	N/A ³	N/A ³	N/A ³	N/A ³
Scanned image	—	20	N/A ³	N/A ³	N/A ³	N/A ³	N/A ³

* The Agfa cameras' images can be improved by rendering with the bundled photo-enhancement software PhotoGene. N/A¹—Not applicable. The camera's LCD cannot be disabled. N/A²—Not applicable. The camera's LCD is not used as a viewfinder. N/A³—Not applicable. We did not run the test for this image.

◀ The Nikon Coolpix 900s was the jury favorite on both our Print Photo Jury test and Web Photo Jury test. A close second was the Kodak DC260. Predictably, the low-res Agfa ePhoto 780 and Sony MVC-FD81 fared the worst in print.

The Fujifilm MX-500, Casio QV-7000SX, and Epson PhotoPC 700 demonstrated the best resolving power in the horizontal direction. Their vertical transition ratios were good but not in the class of the Kodak DC210 Plus.

The Agfa ePhoto 780 and Sony MVC-FD71 captured the most shots in 30 seconds, but they also had the advantage of having low-resolution (640-by-480) images to process. Among the higher-resolution cameras, the Nikon Coolpix 900s and Olympus D-400 Zoom were slightly faster than the rest.

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claim the camera can produce (for example 1,280-by-1,024). The results we report on our chart (horizontal and vertical) are the ratios of (A) the number of transition pixels we counted on the intersection of a diagonal border of black and white targets to (B) the number of pixels in the horizontal and vertical widths of the black square (see the photo). The results, reported as percentages, indicate relative performance, with lower scores being better.

The Fujifilm MX-500, Casio QV-7000SX, and Epson PhotoPC 700 demonstrated the best transition ratios in the horizontal direction; their vertical ratios were among the best, but not as good as that of the Kodak DC210 Plus. Both the Kodak DC260 and the Nikon Coolpix 900s also performed well. By contrast, the Leica digilux and Fujifilm MX-700 displayed optical resolving power unsuited for capturing images at 1,280-by-1,024—which comes as a bit of a shock if you consider Leica's leading position in the high-end market for traditional camera lenses.

In addition to our jury and Transition Ratio tests, we performed high-resolution **Burst Mode** tests, which indicate a camera's image-processing performance as well as its speed in recharging between consecutive shots using a flash. The VGA-resolution cameras (Agfa ePhoto 780, Sony MVC-FD71) did the best on these tests, because of the smaller amount of image-processing time involved. The Nikon Coolpix 900s and Olympus D-400 Zoom were the quickest draws among higher-resolution cameras.

How We Tested

We conducted our Print Photo Jury test with photographic images produced by our reviewers. The reviewers shot a common target from a distance and angle that would yield an image with consistent size and orientation, though there are still slight differences due to the inherent characteristics of each lens. Each camera was set to acquire shots at the highest image quality mode, and—if available—the camera's white-balance control was adjusted for the fluorescent lights in our lab. We used each camera's built-in flash, adjusted at the reviewer's discretion. Each reviewer acquired multiple images and submitted the best one for the jury test. We used the popular HP DeskJet 722C color ink jet printer to print images at 300 dpi onto HP Premium Glossy Photo paper. Each juror was then asked to rank the images in the order of best cam-

era to worst camera by executing an insertion-sort routine. We derived the final ranking by averaging the ordinal values that each camera's image received from the jurors.

For the Web Photo Jury test, we converted the same images used in the Print Photo Jury test to 360-by-480 at 72 dpi, which is the most commonly used resolution for displaying digitized images on monitors. We embedded these images in HTML pages, and the jurors viewed them using Netscape Navigator 4.07. A Java applet was used to display and rank two on-screen images at a time and then execute an insertion sort according to each juror's selection between the two images. At the end of each juror's ranking session, the applet ordered all of the images from best to worst. We then averaged the ordinal values each camera's image received and derived the final ranking.

We used the Transition Ratio tests to rate each camera's accuracy in resolving fine details in the target. For a test target, we used a black box with a square hole, a part of which was covered with a sheet of white paper. The edge of the paper was

oriented with a 10 percent diagonal grade. With each camera set to the highest-quality mode, we shot the target using the camera's own flash and minimal ambient light. Each camera was fixed to a copy stand and positioned at a distance that would yield a target image of the same size relative to the frame. We loaded and magnified the acquired image into Adobe Photoshop, converted to gray-scale, performed a histogram stretch to match the black point and the white point, clipped 20 percent at either end of the gray scale, and then counted the transition pixels in between. Shown at left is a sample photo of the target used and a magnified view of the transition pixels.

The Burst Mode tests are a measure of the camera's ability to process high-resolution images quickly and recharge the power to capture consecutive shots (using the flash). We put each camera on a tripod and shot a fixed target under constant lighting conditions. With each camera, we attempted to acquire as many shots as we could in 30 seconds with the LCD on. We then repeated the process with the LCD off. We used Kodak Photolife 1.5V alkaline AA batteries for all cameras, except for the ones requiring proprietary batteries.—*Analysis written by S. Jae Yang*

Special thanks to Edward M. Granger for devising the image-quality test methodology and to Glenn Menin for data analysis.

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Go to PC Magazine Online
to access these test results
and compare the image
samples for yourself



Visioneer PaperPort OneTouch scanner



Traditional film image (from PhotoCD)



Agfa ePhoto 780 (640 x 480) \$300



Agfa ePhoto 1680 (1,600 x 1,200) \$800

about the samples... We conducted our Print Photo Jury test with photographic images produced by our reviewers. The reviewers shot a common target from a distance and angle that would yield an image with consistent size and orientation of the subject, though there were still slight differences due to the inherent characteristics of each lens. We set each camera to acquire shots at the highest resolution supported and set the flash to Auto mode.

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Eastman Kodak DC210 Plus (1,152 x 864), \$499



Eastman Kodak DC260 (1,536 x 1,024), \$899



Epson PhotoPC 700 (1,280 x 960), \$600



Fujifilm MX-500 (1,280 x 1,024), \$500



Fujifilm MX-700 (1,280 x 1,024), \$600



Konica Q-M100V (1,152 x 872), \$600



Lurca digilux (1,280 x 1,024), \$600



Olympus D-400 Zoom (1,280 x 960), \$800



Olympus D-620L (1,280 x 1,024), \$1,200



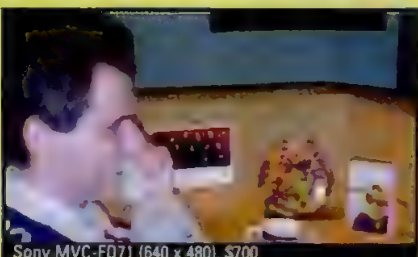
Ricoh RDC-4200 (1,280 x 960), \$500



Ricoh RDC-4300 (1,280 x 960), \$600



Sanyo VPC-X300 (1,024 x 768), \$500



Sony MVC-FD71 (640 x 480), \$700



Toshiba PDR-M1 (1,280 x 1,024), \$500

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Nikon Coolpix 900s



1,280 x 960; CompactFlash. \$800 street. Melville, NY; 800-526-4566, 516-547-4366; www.nikonusa.com; 508 at www.pcmag.com/infolink.

Aimed at the entire range of photographers from consumers to professionals, the

Nikon Coolpix 900s offers a combination of ease of use, picture quality, and versatility unmatched in this roundup. It's our Editors' Choice for high-end users, though any users with some room in their budgets will be well-served with this choice.

During our hands-on shooting tests, we found that the Coolpix's automatic mode worked well for most pictures. But for more serious photographers, the robust manual mode offers control over almost every shooting parameter. Nikon even offers Coolpix-specific optional lenses, including a wide-angle lens (\$100 street) and a 185-degree fish-eye lens (\$200). The latter works with the bundled iPix Immersive 3-D software to let you stitch together a full 360-degree view with just two shots.

The Coolpix's image quality earned it first place on both the printed-output and Web jury tests, and some of the better scores on our Transition Ratio tests. Colors were believable and attractive, the image was sharp, and the flash did a good job of lighting the background, showing full detail without overexposing the foreground. Note that the Eastman Kodak DC260, which is priced comparably, came in close to the Coolpix 900s in image quality. The additional lenses available for the Nikon, however, tilt the balance in its favor. —MDS



than most other cameras, which degrades image quality. Still, the floppy disk convenience and other features make the Sony MVC-FD81 (\$800 street) our Editors' Choice for business users.

There are times when you want to have the camera tethered to the computer, such as when you're updating the camera's ROM, shooting by remote control from a stationary position, or changing some of the camera's parameters. The Kodak DC260 leads the way to the future

by discarding the slow serial port in favor of a much easier and faster USB connection. Look for most cameras to offer USB ports by this time next year.

Although most of the cameras we tested feature an electronic zoom, whereby the camera's intelligence magnifies a portion of the image, eight cameras include true optical zooms like those found on traditional cameras. Optical zoom always yields far better images than electronic zoom. Many cameras also have audio

Hitachi M2: Video, Too

Digital still cameras are great business presentation tools that make adding photographs to slide shows and Web pages easy. But getting motion video clips into usable digital form is much more difficult—unless you use the Hitachi M2 (\$1,499 list).

This handy, 1.2-pound camera completely obviates the onerous task of capturing analog video and then compressing it into digital form. Simply choose "movie record" and the M2 turns into a digital camcorder that can take up to 27 minutes



of MPEG-1 video at a smooth 30 frames per second. To output the video, just remove the 260MB PC Card hard disk and pop it into a PC Card slot.

The M2 is a respectable single-frame capture device (at 704-by-480 resolution). Its bundled hard disk can store up to 3,000 JPEG photos, but it lacks flash and an optical viewfinder, and the 1.8-inch LCD is small. Video images are also small (352-by-240) and grainy in their MPEG-1 format. But even though the M2 can't match the quality of megapixel still-image cameras or digital video camcorders, nothing matches it for pure convenience. (Hitachi America, Brisbane, CA: 800-225-1741; www.hitachi.com; 514 at www.pcmag.com/infolink.)—John R. Quain

annotation, which lets you record a small sound bite of several seconds to identify or add information to an image. This can be great for identifying and labeling your shots as you take them.

One of the more interesting features is the video-clip capability found on four of the models we tested. Although you can't record full-length home movie-type videos, you can save a few seconds of motion video instead of still images, which may be all you need for a Web video or e-mail.



Olympus D-400 Zoom, D-620L

D-400 Zoom: 1,280 x 960; SmartMedia. \$800 street. **D-620L:** 1,280 x 1,024; SmartMedia. \$1,200 street. Melville, NY; 800-347-4027, 516-844-5000; www.olympusamerica.com; 509 at www.pcmag.com/infolink.

The Olympus America digital cameras are meant for both the high-end consumer and business markets. Alas, each has a high price for the features and quality it delivers relative to the other cameras we tested.

The Olympus D-400 Zoom is physically similar to the Olympus Stylus Series point-and-shoot film cameras, with a sliding lens cover that's also the power switch. The LCD menus are easy to follow, though we repeatedly switched the camera off accidentally while trying to review pictures on the LCD. Image quality is a mixed bag. The flash does a great job of lighting up the far end of a large room, but it also tends to overexpose anything nearby unless you adjust the exposure compensation setting. Our jury rated the image quality eighth for printed output but far back in the pack in the Web-based evaluation, due in part to a lack of image sharpness. Ultimately, it's hard to recommend this camera, as you can get better image quality from the similarly priced Eastman Kodak and Nikon offerings.

The Olympus D-620L employs true through-the-lens viewing like that of an SLR camera, though the front-heavy weight distribution makes it easy to jiggle the camera when snapping a photo. Note, too, that you can't use the LCD as a viewfinder; it's only for reviewing pictures and for changing menu settings. And image quality was mixed. On the plus side, the flash does a good job of lighting up the background. For its printed images, the jury rated the D-620L third, with some jurors giving it first place despite a slightly overexposed foreground. On the downside, images had a cyan tinge on a monitor screen; the D-620L's low jury ranking tied the D-400's in our labs. If you want the look and feel of an SLR camera, the D-620L might be for you. Just be aware that the Eastman Kodak and Nikon competitors offer better images for hundreds less. —MDS

And Kodak is the first manufacturer to build in a camera operating system: Digi-ta's FlashPoint.

A camera OS can greatly extend functionality, especially for nonphotographers, by programming in a series of instructions of what and how to shoot. For instance, a real-estate company can develop frame-by-frame guidelines for agents shooting a house, such as reminders to shoot the front from a distance of 25 feet, the side from 40, the back from 35, the

garage straight on, and so on.

There are some tradeoffs with digital cameras. First, there is a delay—in some cases of half a second to 2 seconds—between the moment you press the shutter button and when the camera actually takes the picture. That takes some getting used to and makes some slower cameras ill suited for quick-action shots and candid. Also, you'll typically have to wait several seconds while the image is being processed and stored before you can

Ricoh RDC-4200, RDC-4300

RDC-4200: x 960; SmartMedia. \$500 street. **RDC-4300:** 1,280 x 960; SmartMedia. \$600 street. Sparks, NV; 800-225-1899, 702-352-1600; www.ricohcpg.com; 510 at www.pcmag.com/infolink.

These two new digital cameras from Ricoh are affordable, feature-rich models that perform respectably for their price, though they're not stand-outs in the field. Each offers goodies that the other lacks, ranging from minor to substantial.

For example, the matte-black Ricoh RDC-4200 has a 2X digital zoom, plus time-lapse, sepia, and monochrome modes. The brushed-chrome Ricoh RDC-4300 has a slightly larger, 2-inch color LCD panel (compared with the 1.8-inch panel on the RDC-4200), the ability to annotate images with sound bites, four nickel hydride batteries with a recharger, and a more generous software bundle that includes Kai's LogoMotion, MetaCreations' Powershow, and QuickStitch for making panoramic shots.

The cameras share common ergonomics and a common operating system. Each also fits in the hand comfortably, with the rotating lens on the left. Buttons are well placed. The only oversight is the lack of an optical viewfinder.

Generally, both cameras produced acceptable-to-good images, with excellent detail and very slight jaggles in some fine diagonal lines at full resolution. In bright sun the contrast was somewhat harsh. On the whole, however, skin tones and color saturation were good. The RDC-4200 was preferred by our jury, placing fourth for printed output and midpack for Web-based images. The RDC-4300, meanwhile, placed well for Web display (seventh) but a disappointing sixteenth in printed output. Both units offer a good value and features for general-purpose and business photography. The similarly priced Epson, Fuji, and HP cameras produced better images on our tests, but these Ricohs won't disappoint. —James Karney



shoot another. Some of the higher-end cameras (such as the Kodaks and the Nikon) have a burst-mode setting that lets you snap concurrent frames—but you have to select this option first.

Another disadvantage is battery drain. If you load typical alkalines, expect only about 20 to 30 minutes of shooting time. About half the cameras here include rechargeable batteries in the bundle; the lower-priced models generally include only alkalines in the box to get you going,



Sanyo VPC-X300

1,024 x 768; SmartMedia. \$500 street. Chatsworth, CA; 818-998-7322; www.sanyo-digital.com; 511 at www.pcmag.com/infolink. The Sanyo VPC-X300 digital camera is targeted for business users who want a straightforward imaging tool, and it's also a fun, convenient, and affordable point-and-shoot camera for the rest of us. Printed images are a bit subpar, but on-screen photos are impressive.

The brushed-chrome finish and sliding lens cover make the VPC-X300 look like a conventional point-and-shoot camera and this Sanyo model is nearly as easy to use. When you want to get out of fully automatic mode, you'll find the unit's controls easy to follow. Adding voice annotations (up to 4 seconds apiece) to your images is also easy to do. The VPC-X300 produces eye-pleasing, bright, crisp pictures. The camera was ranked fifth by our jury for displaying sharp photo images on-screen, making it ideal for business presentations. The VPC-X300 lost marks for the photo printouts it produced, however, ranking near the bottom of the group. But if on-screen output is your main concern, this camera should suit you just fine. —JRG

Image Transfer: Easier than Ever

One of the chief virtues of digital imaging is that it lets you store your snapshots in a standard PC and print them out later whenever you need them. The question is, how do you get the photos out of the camera in the first place? Today, a number of new products can replace your camera's slow, cumbersome serial connection.

Most noteworthy is the **ActionTec CameraConnect Pro** (\$50 street). This handy reader has three slots—for CompactFlash, SmartMedia, and a PC Card. It connects easily to your parallel port and printer, and it appears as a logical drive in Explorer. (Sunnyvale, CA; 800-787-7001; www.actiontec.com; 515 at www.pcmag.com/infolink)

If your camera uses CompactFlash or SmartMedia memory, chances are you have (or can buy) an adapter that lets you read those disks in a PC Card drive.

That's great for laptop users, but what if you want to load images to a desktop computer? Enter the **SCM SwapBox** line of PC Card readers (\$89 list for an internal IDE or external parallel port). Like the CameraConnect Pro, they're assigned drive letters in Explorer, so you can access the media as you would any other removable drive. (Los Gatos, CA; 408-370-4888; www.scmicro.com; 516 at www.pcmag.com/infolink)

If you've opted for a camera that uses SmartMedia memory, an easier solution is the **SmartDisk FlashPath** floppy disk adapter (\$79.99 direct), from SmartDisk. Shaped like a 3.5-inch floppy disk, it works in any standard floppy disk drive. Just pop your SmartMedia card into the FlashPath and slip the adapter in your floppy disk drive for access to your images. (Naples, FL; 941-643-1500; www.smartdisk.com; 517 at www.pcmag.com/infolink)

If you plan on being out in the field, the prospect of

bringing enough memory cards can be expensive. The long-awaited **Iomega Click!** drive (\$200 street) is one solution. This battery-operated drive—rechargeable in its special connector, which plugs into your PC—makes it easy to store images safely (and in quantity) when you're out on a shoot. Just insert your CompactFlash or SmartMedia card into the appropriate slot on the pocket-size drive, and copy the data onto the 40MB Click! media disk (\$10 street) installed on the other end. (Roy, UT; 800-697-7833; www.iomega.com; 520 at www.pcmag.com/infolink)

For users who just want to send digital photos directly from a camera to a printer, there are several

options available. The snazziest is the **Lexmark Photo Jet-printer 5770** (\$350 street). A standard home-and-office ink jet, the Jetprinter 5770 comes with two slots on the chassis—one for CompactFlash cards and one for SmartMedia. When you want to print, you can just insert the appropriate card and print out, using the prompts that appear on the LCD. (Lexington, KY; 800-538-6275; www.lexmark.com; 519 at www.pcmag.com/infolink)

Another option is the **Syntran CamPrint** (\$120 street). Just hook one end of this box-and-cable system to your digital camera's serial-out port and the other end to your printer's rear plug. The CamPrint's firmware then runs your images right through. One caveat, though: The CamPrint will work only with certain cameras and certain printers. Check with Syntran or your dealer before buying. (San Jose, CA; 408-573-1788; www.syntran.com; 518 at www.pcmag.com/infolink) —Josh Levy



so plan on adding a set of rechargeables (about \$25, including charger). The Sony Mavicas, equipped with lithium ion batteries like those found in camcorders, showed the best battery life on our informal tests and also display a status icon that gives a relatively accurate countdown of how many minutes of power are left.

Then there's complexity. Today's digital cameras tend to be complicated to operate, once you get beyond the default mode. Our reviewers reported varying degrees of diffi-

culty in figuring out what the various icons mean and which command sequences activate what features or options. Be prepared for a little extra study before you master all your camera's capabilities.

THE NEXT STEP

So what can we expect to see around the millennium? The next generation of digital cameras will be 2-megapixel devices that will yield even higher-quality images. The majority will attach to the computer via a

plug-and-play USB port for easy downloading, and new storage capacity will also grow considerably, as IBM, Iomega, and other companies offer alternative devices such as tiny hard disks that fit inside digital cameras or cigarette pack-size external hand-held devices for rapid storage from existing memory cards.

Today's digital cameras are better than ever. But some are definitely better than others. Read on to find out which models best fit your budget and shooting needs.

SUMMARY OF FEATURES

See www.pcmag.com for interactive views

Digital Cameras

	Agfa ePhoto 780	Agfa ePhoto 1680	Casio QV-7000SX	Eastman Kodak DC210 Plus	Eastman Kodak DC260	Epson PhotoPC 700	Fujifilm MX-500	Fujifilm MX-700	HP PhotoSmart C30	Konica Q-M100V
■ YES ■ NO										
Price	\$300 street	\$900 street	\$700 street	\$499 list	\$899 list	\$600 street	\$500 street	\$600 street	\$400 street	\$600 street
Best resolution	640 x 480	1,600 x 1,200	1,280 x 960	1,152 x 864	1,536 x 1,024	1,280 x 960	1,280 x 1,024	1,280 x 1,024	1,152 x 872	1,152 x 872
Number of pixels	2.5 million	1.3 million	1.3 million	2.5 million	1.6 million	1.3 million	1.5 million	1.5 million	1.0 million	1.1 million
Weight	10 ounces	24 ounces	10 ounces	12 ounces	18 ounces	13 ounces	8 ounces	10 ounces	11 ounces	10 ounces
Internal memory amount	None	None	None	None	None	4MB	None	None	4MB	3MB
Removable memory type	SmartMedia	SmartMedia	CompactFlash	CompactFlash	CompactFlash	CompactFlash	SmartMedia	SmartMedia	CompactFlash	CompactFlash
Image capacity standard/best	96 / 12	48 / 6	55 / 14	120 / 26	90 / 16	50 / 7	22 / 5	44 / 11	40 / 8	50 / 10
LCD viewer size	1.8 inches	2.0 inches	2.5 inches	1.8 inches	2.0 inches	2.0 inches	1.8 inches	2.0 inches	1.8 inches	1.8 inches
Optical viewfinder included	■	■	■	■	■	■	■	■	■	■
Equivalent 35-mm camera lens	50 mm	38-114 mm	32-64 mm	29-58 mm	38-115 mm	36 mm	35 mm	35 mm	43 mm	39 mm
Optical zoom level/Digital zoom level	N/A / N/A	3x / 2x	2x / 4x	2X / N/A	3X / 2X	N/A / 2X	N/A / 2X	N/A / 2X	N/A / 2X	N/A / 2x
Closest focus (macro mode)	3 inches	8 inches	4 inches	8 inches	12 inches	4 inches	4 inches	4 inches	10 inches	8 inches
Panoramic mode	■	■	■	■	■	■	■	■	■	■
Video capture capabilities	■	■	■	■	■	■	■	■	■	■
User can load images to camera/TV-out	■	■	■	■	■	■	■	■	■	■
Sync to external strobes	■	■	■	■	■	■	■	■	■	■
Can run on standard alkaline batteries	■	■	■	■	■	■	■	■	■	■
Bundled software	Agfa PhotoVista, K-A Photo Soap, PhotoVista	Agfa PhotoWise, LivePix, PhotoVista	Adobe PhotoDeluxe, PictureWorks, Spin Panorama, Spin Photo Object	Adobe PageMill, Adobe PhotoDeluxe, PictureEasy	Adobe PageMill, Adobe PhotoDeluxe, PictureEasy	Serra Imaging Image Expert	Adobe PhotoDeluxe	Adobe PhotoDeluxe	HP Photo-Finishing Software, Microsoft Picture It!	Adobe PhotoDeluxe
Companion printer list price/technology	N/A	N/A	\$199/dye sub	N/A	N/A	\$279/mk jet	\$499/dye sub	\$499/dye sub	\$299/ink jet	N/A
Printer works directly from camera	N/A	N/A	■	■	■	■	■	■	■	N/A
Toll-free technical support	■	■	■	■	■	■	■	■	■	■

	Leica digilux	Nikon Coolpix 900s	Olympus D-400 Zoom	Olympus D-620L	Ricoh RDC-4200	Ricoh RDC-4300	Sony VPC-X300	Sony MVC-FD71	Sony MVC-FD61	Toshiba PDR-M1
Price	\$600 street	\$800 street	\$800 street	\$1,200 street	\$500 street	\$600 street	\$500 street	\$700 street	\$800 street	\$500 street
Best resolution	1,280 x 1,024	1,280 x 960	1,280 x 960	1,280 x 1,024	1,280 x 960	1,280 x 960	1,024 x 768	640 x 480	1,024 x 768	1,280 x 1,024
Number of pixels	1.5 million	1.3 million	1.3 million	1.4 million	1.3 million	1.3 million	810,000	350,000	850,000	1.5 million
Weight	11 ounces	12 ounces	10 ounces	16 ounces	10 ounces	10 ounces	10 ounces	20 ounces	23 ounces	8 ounces
Internal memory amount	2MB	None	None	None	None	None	None	None	None	None
Removable memory type	SmartMedia	CompactFlash	SmartMedia	SmartMedia	SmartMedia	SmartMedia	SmartMedia	Floppy disk	Floppy disk	SmartMedia
Image capacity standard/best	44 / 11	24 / 6	120 / 18	100 / 8	70 / 6	70 / 6	60 / 12	40 / 17	40 / 6	22 / 5
LCD viewer size	2.0 inches	2.0 inches	1.8 inches	1.8 inches	1.8 inches	2.0 inches	2.0 inches	2.5 inches	2.5 inches	1.8 inches
Optical viewfinder included	■	■	■	■	■	■	■	■	■	■
Equivalent 35-mm camera lens	35 mm	38-115 mm	35-105 mm	36-110 mm	35-105 mm	35-105 mm	36 mm	40-400 mm	37-111 mm	39 mm
Optical zoom level/Digital zoom level	N/A / 2X	3x / 2X	3X / 2X	3X / N/A	3X / 2X	3x / N/A	3x / N/A	10x / N/A	3x / N/A	N/A / 2x
Closest focus (macro mode)	3.5 inches	3 inches	8 inches	12 inches	3 inches	3 inches	8 inches	1 inch	1 inch	4 inches
Panoramic mode	■	■	■	■	■	■	■	■	■	■
Video capture capabilities	■	■	■	■	■	■	■	■	■	■
User can load images to camera/TV-out	■	■	■	■	■	■	■	■	■	■
Sync to external strobes	■	■	■	■	■	■	■	■	■	■
Can run on standard alkaline batteries	■	■	■	■	■	■	■	■	■	■
Bundled software	Fuj-Etouch, MacroPix, Picture Publisher 7.0	Adobe PhotoDeluxe, InMedia, Presentations, Slide & Sound Plus, iPix, Quick Stitch	Adobe PhotoDeluxe, Olympus Cammedia, Master QuickStitch	Adobe PhotoDeluxe, Olympus Cammedia, Master QuickStitch	ArcSoft PhotoBase, ArcSoft PhotoStudio	ArcSoft PhotoBase, ArcSoft PhotoStudio, iPix, Power Show, iInformation, QuickStitch	MGI PhotoSuite SE	ArcSoft PhotoStudio	MGI PhotoSuite SE	Sierra Imaging Expert
Companion printer list price/technology	N/A	N/A	\$399/dye sub	\$399/dye sub	N/A	N/A	N/A	\$499/dye sub	\$499/dye sub	N/A
Printer works directly from camera	N/A	N/A	■	■	N/A	N/A	N/A	■	■	N/A
Toll-free technical support	■	■	■	■	■	■	■	■	■	■

N/A—Not applicable. The product does not have this feature.

Sony MVC-FD71, MVC-FD81



MVC-FD71: 640 x 480; floppy disk. \$700 street. MVC-FD81: 1,024 x 768; floppy disk. \$800 street. Park Ridge, NJ: 800-222-7669, 201-930-1000; www.usa.sel.sony.com; 512 at www.pcmag.com/infolink.

Sony targets its Digital Mavica line at the consumer market, with the low-resolution Sony MVC-FD71 aimed at casual users and the higher—and Sony MVC-FD81 at a more demanding audience. The MVC-FD81's convenient floppy disk storage and video capabilities make it our Editors' Choice for business pros, though we recognize that its image quality is not the best for the price.

Both cameras offer easy controls and long-lasting rechargeable lithium batteries. What stands out is their unique storage: A built-in floppy disk drive saves images to standard 1.44MB disks, making data transfer to a laptop or desktop PC a no-brainer (no adapters to lose). You can hand off image files without caring whether you get the media back, which you would not do with a \$50 miniature flash card. The battery's remaining charge (in minutes) is reported on the LCD, which is backlit with Sony's battery-saver Solar Window feature. Another welcome touch: Control settings are help-labeled with text, not obscure icons.

We included the VGA-resolution MVC-FD71 in this overview as a comparison with the megapixel cameras. Not surprisingly, it came in last on printed and Web-based jury tests. Colors were a touch cyan in print and a touch green on screen, and the VGA resolution produced a soft-focus effect. The MVC-FD71 trades off too much in image quality to be worth the price in the current market.

The new MVC-FD81, in addition to its higher resolution, lets you record 60 seconds of MPEG video at 160-by-112 resolution, or 15 minutes at 320-by-240, per floppy disk. The model for serious users is great for attaching to e-mail or posting on a Web site, as well as being ideal for insurance-claim documentation or video greetings to Grandma in Florida.

Still-image quality (at 16 images per floppy disk) was okay, though not

nearly as good as from similarly priced cameras from Kodak and Nikon. The flash was able to fill the background without overexposing the foreground, and resolution was high enough to yield sharp focus. Colors were a bit oversaturated in print, but not on-screen. In our eyes, the floppy disk storage and video capabilities make up for the merely adequate image quality. —MDS



Toshiba PDR-M1

1,280 x 1,024; SmartMedia. \$500 street. Irvine, CA: 800-288-1354, 949-461-4970; www.dsc.toshiba.com; 513 at www.pcmag.com/infolink.

The Toshiba PDR-M1 is a basic, affordable, point-and-shoot device that offers easy operation, clear menu choices, and acceptable but not spectacular image quality.



The camera fits well in the hand, with well-placed buttons and flash. Images were okay, but not as good

as from other affordable models from Fuji, HP, and Ricoh. Contrast and brightness were slightly low, both indoors and out, even with full flash at normal distances. Detail was good, despite a general soft-focus effect. Outdoor pictures rendered high-contrast scenes a bit better than average, with good detail in the midrange but not in shadows, which were too dark. Our

jury ranked the PDR-M1's image thirteenth in print and fourteenth in Web-based output.

The Toshiba PDR-M1 is best suited for simple snapshots and routine general photography tasks that don't demand critical focus or advanced features. Its ease of use and simple if basic software will appeal to users with less sophisticated needs. If you need more, shop around. —JK

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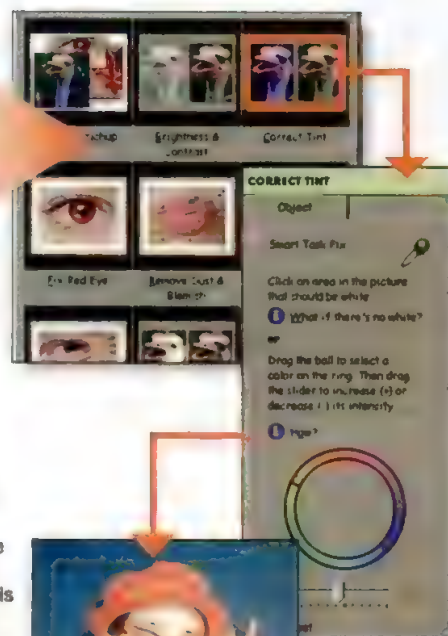
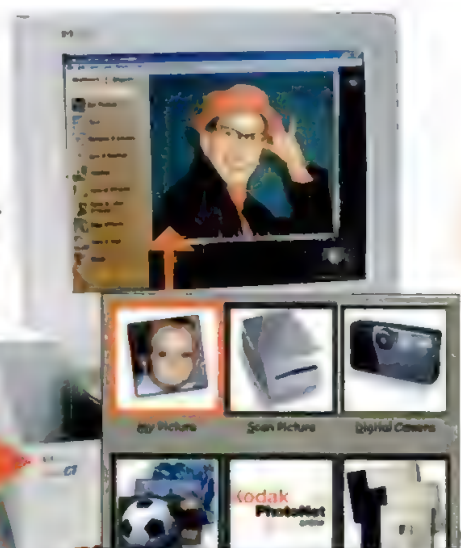
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point & shoot Software

*You've heard it all before. This time it's no exaggeration:
Anyone can get great results with these simple yet sophisticated
image-editing packages.*

By Sally Wiener Grotta and Daniel Grotta

1 INPUT Before you can begin working with your photos, you have to get them into your PC. Digital cameras and scanners include utilities to transfer images based on Twain or proprietary interfaces. But with today's image-editing programs you can bypass these utilities and import images directly from Twain-compliant devices. Shown here is Microsoft Picture It!'s Get Pictures command. Other important features include links to Internet services and support for a range of graphics file formats.



2 IMAGE CORRECTION You don't have to be a professional photographer to make your images look their best. In this example, we took the imported image and cropped it to remove much of the background. Then we used Picture It!'s Quick Touchup feature to correct tint and adjust brightness and contrast. Other notable correction tools let you remove red-eye, dust and blemishes, or scratches from photos.



What really drives innovation in the software industry, it is often said, is the home market. That is apparent when you look at how far consumer digital-imaging software has come since our last review a little more than a year ago. The latest image-editing programs are not only significantly easier to use but are also far more capable.

That is great news for home users because it means this category is finally living up to its promise. With image-editing software, you can easily transfer photos from a digital camera, scanner—even the Internet—to your PC. Once you've got them there, the possibilities are virtually endless. Quick fixes, such as removing red-eye or adjusting brightness and contrast, require just a few clicks of the mouse. You can get a little more creative with paintbrushes, text, special effects, artistic frames, and other editing tools. Or really take your

pictures further, adding them to prebuilt projects to create great-looking cards, calendars, brochures, business cards, labels and stickers, and so on. When your masterpiece is complete, you can not only print it but also e-mail it, produce multimedia slide shows, or post it on a Web page.

For this year's roundup, we reviewed six of the leading image-editing packages for home users ranging in price from \$50 to \$55. To give you the full picture, we also tested seven other image-editing programs that provide some of the tools but not the full range of features found in the leading programs. You'll find details on those in the table "Other Image Editors."

At one time, all image-editing software looked like Adobe Photoshop. This was fine for professionals, but it didn't do much for new users or those who didn't want to invest months learning an image-editing program.

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3 CREATIVE EDITING The creative-editing tools turn photos into something more personal. With them you can paint on an image; add text, drop shadows, and other effects; "clone" image areas to copy to other areas; apply filters such as watercolor; and select areas of an image to cut out and combine with other images. In this example, we applied an elliptical cutout to the image and then added a frame from the program's Cool Edges library.



4 PROJECTS The productivity portion of consumer image-editing packages, *projects* are either step-by-step guides or templates that you customize using images and text. Most packages include hundreds of templates for both home and small-business projects. Here we selected an invitation card, and Picture It! walked us through the steps involved, including adding our photo and inserting text.

5 OUTPUT One of the best aspects of these packages is that they give you many ways to share your finished work. Most support specialty papers for creating stickers, business cards, and so on. One critical feature lets you quickly place multiple images onto single-page templates. Other output options include e-mail, slide-show presentations, and the Web.



Midrange programs, such as Jasc's Paint Shop Pro, Ulead's PhotoImpact, ArcSoft's PhotoStudio, and most recently Microsoft's PhotoDraw 2000, are a little easier to use, but they still require some knowledge of image-editing concepts or, as in the case of PhotoDraw, are designed primarily for business users. The evolution of PC photography has helped to change this, delivering a new class of image-editing programs for everyone.

One of the distinguishing traits of these consumer-level image-editing programs is their level of hand-holding. Nearly all of the programs are organized into modules based on the workflow typical in digital imaging, from extracting images from your digital camera all the way to printing out finished projects on specialty paper. Within each of these modes nearly every job has been boiled down to step-by-step tasks.

The first step in image editing is getting your images into the PC. Until recently, consumer image-editing programs relied on the primitive utilities provided with scanners and digital cameras. We're happy to report that those days are over. Products such as Adobe PhotoDeluxe, Ulead Photo Express, and Microsoft Picture It! allow you direct access to these gadgets.

Just about all of the tools you'd expect for correcting and editing images are represented in these packages, but now you

• Microsoft Picture It! 99



The name Picture It! is an apt one for a program that lets you do just about anything with photos. From importing images from digital cameras to retouching

photos to creating and publishing eye-catching projects, Microsoft Picture It! 99 offers the complete package, making it our Editors' Choice selection for the second year in a row.

Picture It! lets you import images directly from digital cameras; clean them up using Quick Touchup tools; apply paint, special effects, and text; and use them in more than 500 pro-

jects that can be printed, e-mailed, or posted to the Web. Microsoft cloaks all this power in a simple, wizard-driven interface.

MGI PhotoSuite II earns an honorable mention for its leading-edge technology. Although PhotoSuite still has a few rough spots, the product breaks new ground in Internet integration and demonstrates the potential benefits of the Web for digital imaging.

edit or combine with other images.

Generally, these packages offer two types of ready-made projects. Guided projects, such as those found in PhotoDeluxe, Corel Print House Magic Deluxe, and Picture It!, are true step-by-step activities. Other programs, including Live Picture's LivePix 2.0, MGI PhotoSuite II, and Ulead Photo Express 2.0, offer templates with placeholders where you can position images. But in either case, you will find a range of projects and a level of quality that will make you look good.

Output options have also expanded. Print options or templates for printing multiple copies of

one or more images on a single sheet of paper help cut down on the cost of ink jet printer consumables. Other printing options to look for include support for specialty papers from companies such as Avery.

Internet-based photo services such as PhotoNet and Fujifilm.net are also good ways to share and access your images.

You can use these links to download images that you shot with an ordinary camera and had processed. Conversely, you can upload images and projects to these services for professional processing. If you have a personal Web site, you can also save projects in Internet-friendly formats (GIF, JPEG, and HTML).

Add up all these advances and it's clear that these consumer image-editing packages have truly arrived. If you've been waiting for the digital-imaging market to come into focus, it's time to make your move.

Adobe PhotoDeluxe Home Edition 3.0

\$50 street (\$40 upgrades). Adobe Systems Inc., San Jose, CA; 800-833-6687, 408-536-6000; www.adobe.com; 521 at www.pcmag.com/infolink.

● All the major pieces are in place to make Adobe PhotoDeluxe Home Edition 3.0 a top-tier image-editing program for home users. It has most of the tools you need and extensive step-by-step guides. But during testing we found ourselves tripping over some of these guides while wishing for more assistance in other areas. Also, some of PhotoDeluxe's editing tools do not work as expected.

PhotoDeluxe operates in two modes that can be used simultaneously: Guided Activities and Advanced Menus. Guided Activities, in most cases, offers step-by-step guidance and tips, but occasionally

Join us Online Want to add a whole new perspective to your photos? Visit our Web site for comparative reviews of the many programs for creating panoramic images. Plus our roundup of online services, such as PhotoNet and Fujifilm.net, will show you the best way to bring your images into the Internet age.

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can let the programs take care of some of the chores for you. PhotoDeluxe and Picture It!, for example, have added quick-touch-up features. Beyond these simple fixes, you'll find a toolbox that is loaded with powerful features: paintbrushes, special effects, horizontal and vertical text with drop shadows, and selection tools for grabbing portions of an image to

Our Contributors: SALLY WEINER GROTTA, DANIEL GROTTA, and STEPHEN W. PLAIN are contributing editors of *PC Magazine*. DIANE JECKER was the project leader, and JOHN MORRIS was the associate editor in charge of this story.



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HELP FOR THE MOBILE WORKAHOLIC

When using TREK² on the plane, try not to laugh when the 14.1 inch monitor dwarfs the guy's next to you. It's just not a very nice thing to do.

Pack light — there's nothing worse than a carry-on that leaves divots in your shoulder, which is why the TREK² is as thin as 1.7".

Avoid the isolation induced by the single-use personal mini-soaps of the hotel room by staying connected with an optional 56K modem.²⁴

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Pediatrician
System: Micron[®] TransPort TREK²
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—PC World, Ranked #1
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and those who do not
travel, read only a page.
—William Goins, III



TREK² 233



TREK² 233



TREK² 266



New!
TREK² 300



Model Name	TREK ² 233	TREK ² 233	TREK ² 266	TREK ² 300
Processor	Intel® Pentium® II processor 233MHz	Intel Pentium II processor 233MHz	Intel Pentium II processor 266MHz	Intel Pentium II processor 300MHz
Cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache
RAM	32MB EDO DRAM	64MB SDRAM	64MB SDRAM	64MB SDRAM
Hard Drive	3.2GB hard drive (removable)*	3.2GB hard drive (removable)*	3.2GB hard drive (removable)*	3.2GB hard drive (removable)*
Monitor	12.1" SVGA TFT display	13.3" XGA TFT display	14.1" XGA TFT display	14.1" XGA TFT display
Extra Storage	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)	3.5" floppy disk drive (dedicated bay)
DVD/CD-ROM	24X CD-ROM drive (dedicated bay)	24X CD-ROM drive (dedicated bay)	24X CD-ROM drive (dedicated bay)	DVD-ROM drive (dedicated bay)
Graphics	4MB AGP graphics accelerator	4MB AGP graphics accelerator	4MB AGP graphics accelerator	4MB AGP graphics accelerator
Sound System	Built-in stereo speakers & microphone	Built-in stereo speakers & microphone	Built-in stereo speakers & microphone	Built-in stereo speakers & microphone
Warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty
Scholarship	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online
Software Included	Microsoft® Windows® 98 System Wizard Mobile Client™™™ Norton AntiVirus	Microsoft Windows 98 Microsoft Office Small Business Edition System Wizard Mobile Client™™™ Norton AntiVirus	Microsoft Windows 98 Microsoft Office Small Business Edition System Wizard Mobile Client™™™ Norton AntiVirus	Microsoft Windows 98 Microsoft Office Small Business Edition System Wizard Mobile Client™™™ Norton AntiVirus
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holes between spreadsheets. I wonder where they're all

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to sound funny. Lying down would be good. Three dollars



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is a lot for water. Solitaire is actually pretty fun for about a

minute. That person looks like somebody I know. I'm actually

excited about the prospect of getting on a plane. Why can't my

cell phone working? That kid keeps staring at my GoBook. This

is better than being in the office, I guess. What's that smell?

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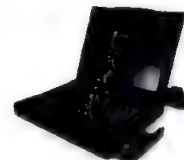
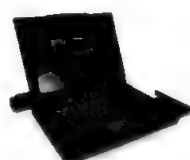
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Cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache	512KB L2 pipeline burst cache
RAM	64MB EDO DRAM	32MB EDO DRAM	96MB EDO DRAM
Hard Drive	3.2GB hard drive*	3.2GB hard drive*	3.2GB hard drive*
Monitor	12.1" SVGA TFT display	12.1" SVGA TFT display	12.1" SVGA TFT display
CD-ROM	24X CD-ROM drive	24X CD-ROM drive	24X modular CD-ROM drive
Graphics	2MB/128-bit graphics accelerator	2MB/128-bit graphics accelerator	2MB/128-bit graphics accelerator
Sound System	16-bit stereo/Wavetable sound	16-bit stereo/Wavetable sound	16-bit stereo/Wavetable sound
Warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty	5-year/1-year Micron limited warranty
Scholarship	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online
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- 8MB SGRAM 3D 2X AGP graphics
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Model Name	Millennia C333	Millennia 350	Millennia 450	Millennia 450 MAX	Millennia 450 MAX
Processor	Intel® Celeron® processor 333MHz	Intel Pentium® II processor 350MHz	Intel Pentium II processor 450MHz	Intel Pentium II processor 450MHz	Intel Pentium II processor 450MHz
Cache	32KB Internal L2 cache	32KB Internal L2 cache	32KB Internal L2 cache	32KB Internal L2 cache	32KB Internal L2 cache
RAM	12MB SDRAM	64MB 100MHz SDRAM	64MB 100MHz SDRAM	128MB 100MHz SDRAM	128MB 100MHz SDRAM
Hard Drive	4.3GB Ultra ATA hard drive*	8.4GB Ultra ATA hard drive*	8.4GB Ultra ATA hard drive*	13.6GB Ultra ATA hard drive*	24.4GB 7200RPM Ultra ATA hard drive*
Monitor	15" Micron 700Hz monitor (15.9" display)	17" Micron 700Hz monitor (15.9" display)	17" Micron 700Hz monitor (15.9" display)	19" Micron 900Hz monitor (18" display)	19" Micron 900Hz monitor (18" display)
DVD/CD-ROM	32X max speed CD-ROM drive	32X max speed CD-ROM drive	32X max speed CD-ROM drive	32X max speed CD-ROM drive	32X max speed CD-ROM drive
Modem	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**	3Com U.S. Robotics 56K WinModem**
Graphics	ATI Radeon 7500 3D AGP graphics	ATI Radeon 7500 3D AGP graphics	ATI Radeon 7500 3D AGP graphics	ATI Radeon 7500 3D AGP graphics	ATI Radeon 7500 3D AGP graphics
Sound System	PCI 64-voice WaveTable sound	PCI 64-voice WaveTable sound	PCI 64-voice WaveTable sound	PCI 128-voice WaveTable sound	PCI 128-voice WaveTable sound
Warranty	3-year/3-year Micron Power™ limited warranty	3-year/3-year Micron Power limited warranty	3-year/3-year Micron Power limited warranty	3-year/3-year Micron Power limited warranty	3-year/3-year Micron Power limited warranty
Scholarship	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online	1-year free* tuition to Micron U online
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Suitability To Task

Adobe PhotoDeluxe Home Edition 3.0



Corel Print House Magic Deluxe 3.0



LivePix 2.0



MGI PhotoSuite II



Microsoft PictureIt! 99



Ulead Photo Express 2.0



POWER

Input	Excellent	Good	Fair	Excellent	Excellent	Excellent
Image correction	Good	Fair	Fair	Good	Good	Good
Creative editing	Good	Good	Fair	Good	Good	Good
Projects	Good	Excellent	Fair	Good	Good	Fair
Output	Good	Fair	Fair	Good	Excellent	Good

EASE

Input	Excellent	Good	Fair	Excellent	Excellent	Good
Image correction	Good	Good	Fair	Good	Good	Good
Creative editing	Good	Good	Good	Good	Good	Good
Projects	Good	Good	Fair	Good	Excellent	Good
Output	Good	Good	Fair	Good	Good	Good

Input For this task, we judge the program's ability to obtain digital images from scanners, digital cameras, and online services. Other desirable features include support for a wide range of file formats and image preview.

Image correction We look at how each product enables the user to fix an image once it is brought into the program. The program should provide both instant (one-click) fixes and individual tools for manually adjusting color and brightness. Other important tools include red-eye removal, sharpening for out-of-focus images, scratch removal, and image restoration.

We also evaluate how the program implements these features.

Creative editing For this task, we evaluate the program's artistic tools, which encompass a range of features. The program should provide a variety of paintbrushes for selectively applying color and effects to images. To select areas of an image to edit or combine with other images, we look for tools that allow you to make quick, precise cutouts and free-form selections. Other significant features include special effects and filters, text tools, and drop shadows.

Projects First, the program should provide a broad

selection of projects that are of high quality and tailored to home users. Second, the program should guide you step by step through the process of adding images to projects and customizing the templates.

Output For print projects, the program should support specialty papers and easily allow the user to place multiple instances of one or more images onto a single page. Other output options we look for include e-mail, multimedia slide shows, Web pages, links to online services, and support for a wide variety of file formats.

you'll come across a dialog box that provides no clues about what to do next. And while Adobe claims to have streamlined operation, we found that basic tasks require too many mouse clicks.

Getting photos from a scanner or digital camera into PhotoDeluxe is remarkably easy. You can also download images from online services via links provided in PhotoDeluxe; however, the program requires plug-ins if you want to use the guided task for downloading. The Easy Photo Gallery, an image database, is

poorly integrated and light on features.

Once you've imported an image, you can quickly correct the color and exposure using the Extensis Intellihance plug-in, a new addition in this version. While the editing tools are extensive, not all of them are fully implemented. For instance, PhotoDeluxe has extensive text tools, but its drop shadow doesn't work on text.

Family projects include greeting cards, calendars, and T-shirt transfers. (A separate Business Edition, also \$50 street, includes small-office and home-office projects.)

The Changeables is a set of 100 clip-art images with controls that let you modify traits, turning a scowl into a smile, for example. Also new are free seasonal activities that are periodically unlocked based on your system clock.

PhotoDeluxe also offers good output options. To save paper, you can position multiple instances of a single image (but not multiple images) on a single-page template. A new multimedia module, Photo-

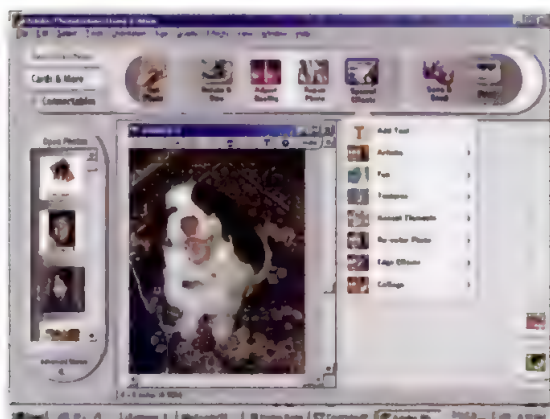
Parade, lets you create charming slide shows, complete with animation and sound, that you can bundle with an included player and e-mail or distribute on floppy disks.

PhotoDeluxe has a lot going for it, but a handful of poorly implemented or missing features keep it from receiving our top honors.

Corel Print House Magic Deluxe 3.0

\$50 street (no upgrades). Corel Corp., Ottawa; 800-772-6735, 613-728-8200; www.corel.com; 522 at www.pcmag.com/infolink.

● A suite of design and personal productivity tools, Corel Print House Magic Deluxe includes Photo House 2.0 for image editing and Print House 3.0, which offers layout tools and projects, plus a combination address book and calendar called Family & Friends. The two main modules, which are based on technology in the professional-level Corel PhotoPaint and CorelDraw, contain some powerful tools not often found in consumer products. But other important features are absent, and the suite lacks a single, unifying interface.



PhotoDeluxe's icons offer easy access to most tasks.

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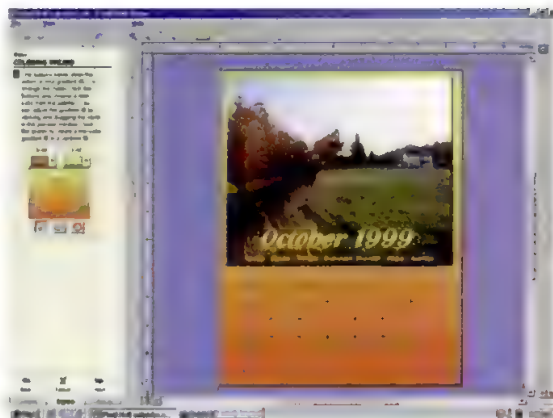


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SOFTWARE

Digital Imaging



Corel's painting tools, such as the gradient fill, are powerful yet easy to use.

Print House Magic has not been updated since our last story a year ago. Version 4.0, which should be released shortly after this story is published, should address some of the program's weaknesses.

Acquiring images from a standard

scanner or digital camera is a simple, guided process. Photo House's Open Image dialog box is the best in its class—including previews and the option to crop or resample a file. Unfortunately, the program has no image catalog, and importing images from the Internet is difficult.

As an image-editing application, Photo House has its highs and lows. On the one hand, it offers no color correction tools. But on the other, Photo House's powerful painting tools

far exceed those of its competitors.

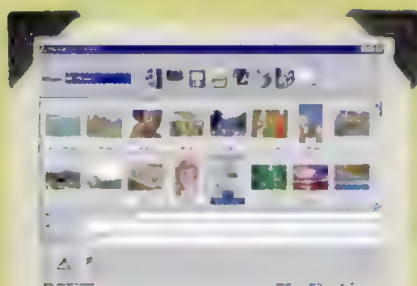
Similarly, Print House provides impressive text tools and lets you use Pre-set Wrappers, which are akin to cutouts, to apply shapes to text or images. Although these Wrapper shapes can be modified, they do not provide the same

flexibility as true selection tools. In Photo House, the selection tools are limited to rectangular and freehand shapes, and the resulting mask can't be edited.

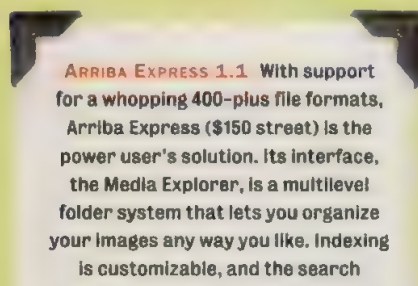
Print House includes more than 2,800 quality, well-organized projects and templates. The Send E-mail command attaches the current image to a memo in your default mail program. However, we were disappointed to discover that when we sent a four-fold greeting card as a JPEG file, it was attached as three separate files. (If the card had been sent in Corel's proprietary format, it would remain a single file, but it could be viewed only by those with Print House installed.) You can print projects on specialty papers, and you can arrange multiple instances of the same image (though not different images) on a single sheet of paper. You can't export Print House Magic projects as multimedia files.

Despite some inspired features, the

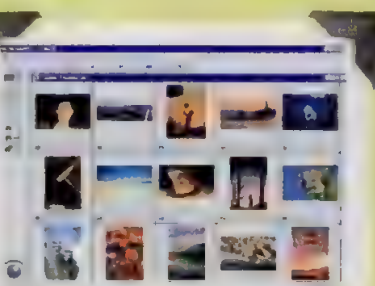
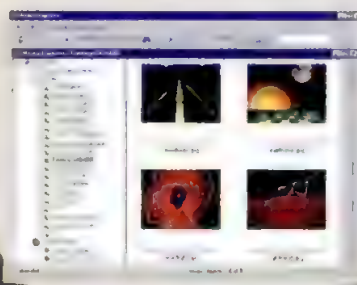
The Digital Shoebox



ARCISOFT PHOTOBASE 2.0 An especially easy-to-use tool, PhotoBase 2.0 (\$35 street) supports nine image-file formats. The interface is straightforward, though rigid. Three customizable description fields display information about selected items, but indexing and searching is limited. A toolbar provides easy access to key functions, such as acquiring photos from Twain devices, and the image editor supports common tasks. A customizable application bar lets you drag items directly to your favorite applications. You can create Web page presentations, video postcards, and slide shows. (ArcSoft Inc., Fremont, CA; 800-762-8657; www.arcsoft.com; 527 at www.pcmag.com/infolink.)



ARRIBA EXPRESS 1.1 With support for a whopping 400-plus file formats, Arriba Express (\$150 street) is the power user's solution. Its interface, the Media Explorer, is a multilevel folder system that lets you organize your images any way you like. Indexing is customizable, and the search facility is robust. Arriba Express's WebVac feature lets you "vacuum" all the media assets off any given Web site. Unfortunately, Arriba Express doesn't support Twain devices, nor can it create slide shows. And its image-editing features are minimal. (Arriba Soft Corp., Naperville, IL; 888-277-4229; www.arribasoft.com; 528 at www.pcmag.com/infolink.)



IMAGEAXS 3.02 More of a media database than album software, ImageAXS (\$40 street) boasts strong search and index capabilities. The program handles 80 file formats, storing them in "collections" that consist of thumbnails and pointers to source files. A toolbar provides access to key functions, including search and keyword management. The Acquire Files window supports batch imports as well as Twain devices. The program provides 20 data fields. Unfortunately, you can't distribute images as slide shows or by e-mail. (Digital Arts & Sciences Corp., Alameda, CA; 800-449-6200; www.dascorp.com; 529 at www.pcmag.com/infolink.)

current version of Corel Print House Magic is missing too many important features to be a serious contender. Currently, Microsoft Picture It! and MGI PhotoSuite are all better choices.

LivePix 2.0

\$50 street (free upgrades via Web site). Live Picture Inc., Campbell, CA; 408-371-4455, www.livepicture.com; 523 at www.pcmag.com/infolink.

● LivePix 2.0, based on FlashPix technology, allows you to work with high-resolution images without sacrificing performance. Although the LivePix interface is arranged well, it offers no on-screen tips, guides, or wizards. Furthermore, its tool set is incomplete.

LivePix does not support Twain devices, so you must use the utility provided with your scanner or digital camera. Though you can import a batch of images from your camera at once, each image must first be named and saved individual-

ly before the driver proceeds to the next one. LivePix links to online services, but don't expect much assistance.

In this version, Live Picture has added serviceable photo correction and a scalable clone tool, but LivePix still lacks paintbrushes and gradient fills. It does, however, support unlimited undos.

LivePix's projects are customizable templates rather than guided activities. You substitute your images for the placeholders in the template. When you substitute a photo, it takes on all the properties (rotation, size, and perspective) associated with the image placeholder. What content LivePix offers is high resolution, providing for quality output, but we'd like to see a greater variety. The gallery offers no search engine.

Printing options are also limited. LivePix can automatically arrange and print multiple copies of an image on the page, but you can't mix and match differ-

ent image sizes, nor can you print multiple images on a single-page template. Although LivePix lacks slide show capabilities, it includes Novita LiveLetter, a multimedia e-mail client.

Until Live Picture enhances the program's image-editing tools, adds true projects, and incorporates the step-by-step model that is standard in this category, LivePix will continue to be most notable for its demonstration of the potential of FlashPix technology.

MGI PhotoSuite II

\$50 street (\$40 upgrades). MGI Software Corp., Richmond Hill, ON, Canada; 888-844-7638, 905-764-7000; www.mgisoft.com; 524 at www.pcmag.com/infolink.

● Beneath its dark and stylish interface, MGI PhotoSuite II hides the most advanced technology in its class. PhotoSuite's framework is actually a set of dynamic Web pages displayed in a transparent version of Microsoft Internet

and more images, it becomes difficult to find just the one you're looking for. The solution is an image-cataloging program, a simple data-

base that lets you organize, annotate, and search for images. Although some of the products in our main story include cataloging util-

ties, these standalone applications support more file formats and offer more comprehensive search capabilities.—Stephen W. Plain

IXLA EXPLORER 1.2 Striking a balance

between power and ease of use, Ixla Explorer (\$20 street) features a Windows Explorer-like interface and "catalogs," which are customizable folders that maintain pointers to media files. Ixla Explorer supports Twain devices and includes direct support for 120 digital cameras. File properties for the approximately 20 supported file formats include date, author, and category. Sorting is limited. Searching is flexible, but image-editing features are lacking, and the slide shows are not flexible. (IXLA Ltd., Danbury, CT; 800-489-6704; www.ixla.com; 530 at www.pcmag.com/infolink.)

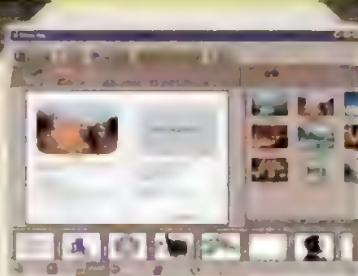
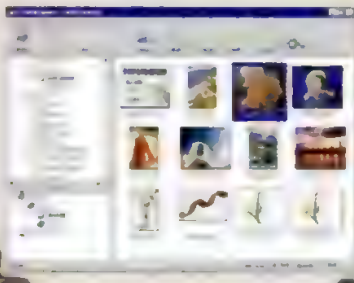
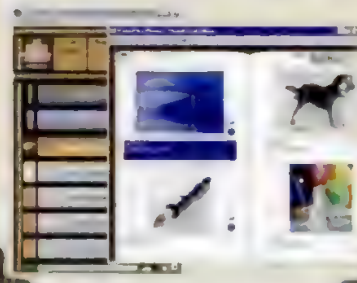


PHOTO ORG 1.0 A truly easy-to-use photo management package, Photo Org (\$50 street) supports 18 file formats—though not GIF. Photo Org is entirely visual, using toolbars rather than menus. Your files are organized in "rolls of film" that can be named and password-protected. You can create albums and greeting cards, and both can be annotated with formatted text. The Photo Editor window is very well designed, combining features such as cropping, zooming, rotation, and red-eye removal. And output includes slide shows and Web pages. (Canon Software Publishing, Costa Mesa, CA; 800-852-2666; www.software.canon.com; 531 at www.pcmag.com/infolink.)

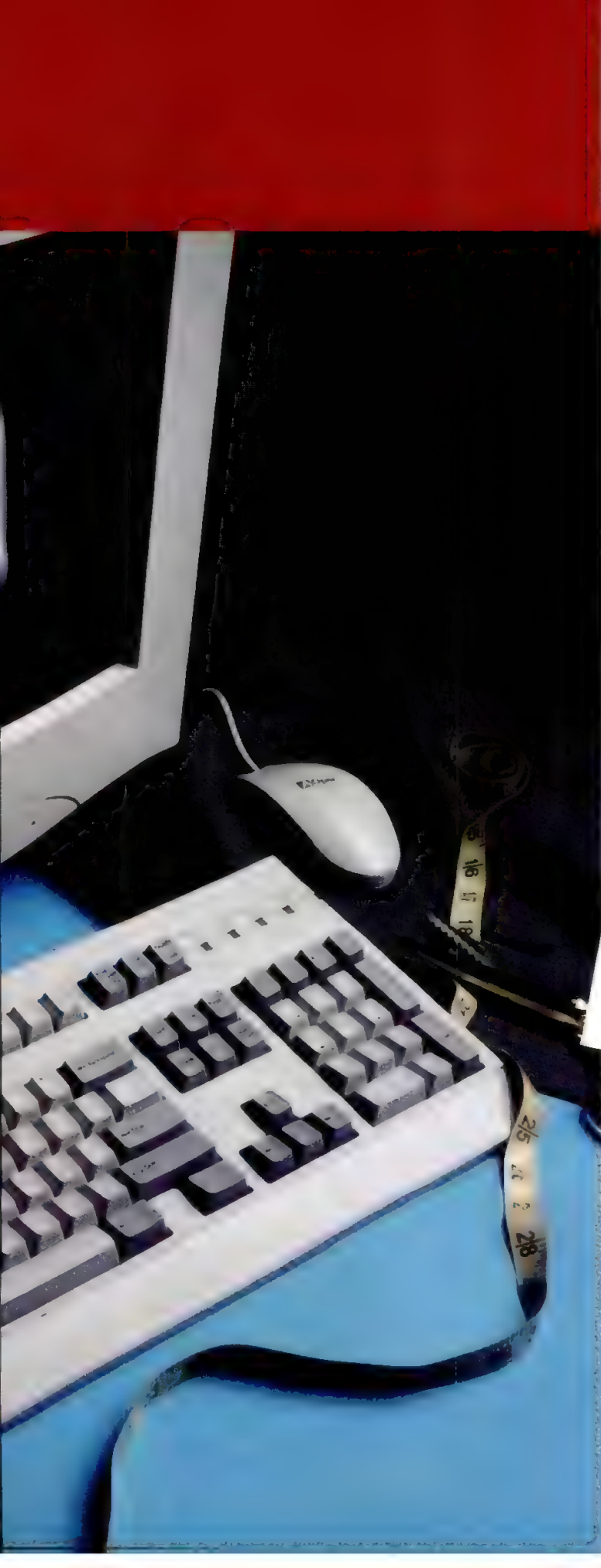
PHOTORECALL DELUXE 2.0 Photo-

Recall Deluxe 2.0 (\$50 street) supports over 25 file formats. It consists of PhotoRecall Library, a graphical representation of shelves with photo albums on them; DarkRoom, for image editing; and UtilityRoom, which offers backup, restore, and compacting. Image editing is robust, including an adjust-by-example facility for changing exposure, color, brightness, and focus. Description fields are also generous and customizable. Distribution options include e-mail, HTML, and slide shows. (G&A Imaging Ltd., Hull, Quebec; 888-772-7601; www.photorecall.com; 532 at www.pcmag.com/infolink.)



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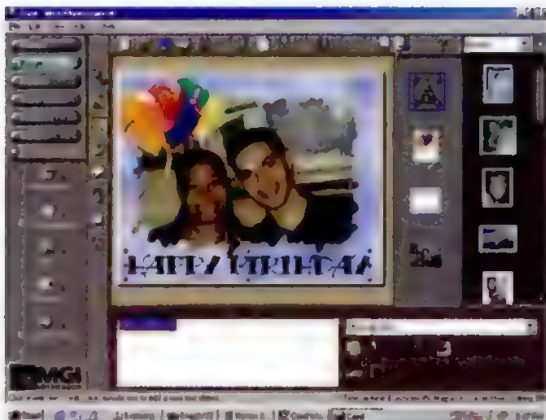


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SOFTWARE

Digital Imaging



PhotoSuite offers over 500 customizable templates with editable text.

Explorer 4.0. The program's tools are grouped into components that run inside this framework, making it easy for MGI to add new features on the fly. Unfortunately, the program still suffers from a couple of usability glitches, giving Microsoft Picture It! the edge.

PhotoSuite is organized into six modes: Photos, Projects, Albums, Slide Shows, Internet, and Guides. Because the Guides section, which provides step-by-step help on most key processes, is separate from the rest of the program and relegated to the last section, new users may have trouble finding it. The Internet mode, an integrated Web browser with links to other photo-related sites, allows you to drag and drop photos from any Web page directly into the program. And since PhotoSuite supports the latest interface standards, you can access digital cameras and scanners directly.

All controls for the current tool are kept on the screen, under the image. When painting, for example, the color, transparency, brush-size, and other options are all just a click away.

PhotoSuite's tools for creating composite images is one of the program's biggest weaknesses. The selection tools are located in the Photo module, but you can "collage" multiple images and work with layers only in the Projects mode.

PhotoSuite's 500-plus projects are editable templates in which you add photos and add or alter text. Print output is versatile, with layouts for single or multiple images on a single page. But PhotoSuite doesn't currently support specialty papers (though MGI says it will offer downloadable templates by the time you

read this). PhotoSuite has a one-click e-mail feature. The Create a Web Page command simply saves a file to a default, unspecified location on your hard disk. To create slide shows, you can drag and drop images onto a storyboard, but your friends will need to download a player to view it.

Aside from a few problem areas, PhotoSuite is already tough competition in this category. If MGI follows through on its plans to take advantage of the program's architecture to provide updates, new tools, and content online, the program can only get better.

Microsoft Picture It! 99

\$55 street (\$20 rebate through September 1999). Microsoft Corp., Redmond, WA; 800-426-9400, www.microsoft.com; 525 at www.pcmag.com/infolink.



Microsoft Picture It! 99 does what a consumer-level image-editing program is supposed to do: It makes digital imaging quick, easy, and fun. Best of all, with Picture It!, "easy to use" does not mean underpowered; the software is packed with features. The result is a program that lets anyone turn their photos into professional-looking projects.

Every tool and function in Picture It! is wizard-driven. Even when you use the new Advanced menus, you're never left on your own. The Picture It! interface consists of four parts: a large toolbar with buttons for each mode, the workspace, a gallery of all the open images, and a window that displays the layers in your active image. You can drag and drop images from the gallery onto the workspace and Picture It! automatically creates a new layer.

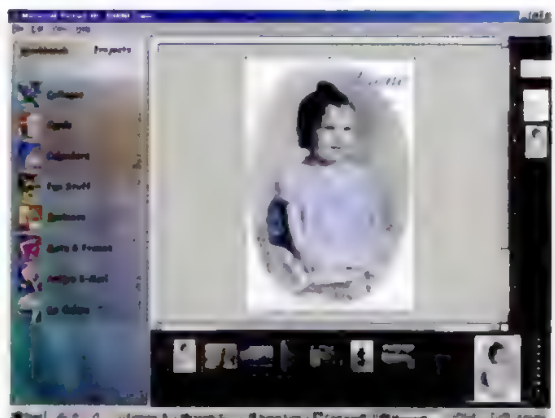
When importing images from scanners and digital cameras, Picture It! supports the most recent standards. If you select "Help me fix my picture after scanning," Picture It! offers to straighten and trim the image and automatically correct the brightness and contrast. The wizard-driven

links to Internet-based services such as PhotoNet and Fujifilm.net are equally easy to use.

The photo catalog, which must be installed separately, is fully integrated and does an excellent job of organizing your photos, offering user-definable folders, descriptions, and keyword searches.

Picture It! can handle just about any image-correction and -editing job you can dream up. All of the correction tools are easy to use, and Picture It! immediately displays previews of any changes on the full-size image. Some of these tools, however, are buried away in different sections of the program.

Painting is fun with the program's wide range of media. Using touch-up brushes, you can paint with varying levels of brightness and contrast, color tint, or transparency. The artistic filters are one-click commands but offer no control over their size or intensity. The text tool offers attractive single-click effects and



Microsoft Picture It! includes a variety of projects, which are all driven by wizards.

shapes, as well as gradient or picture fills. The drop shadows are highly configurable and can be applied to text and objects. Picture It! contains 531 easy to use projects.

Picture It! offers a wide variety of output options. You can print multiple pictures on the same page, create projects for specialty papers from Avery or Hewlett-Packard, e-mail images, and even send postcards and self-running slide shows. The Save to Web wizard displays file size and download time estimates.

A straightforward, intelligently designed, and full-featured program, Microsoft Picture It! 99 is the best way to turn images into art.

Other Image Editors

These alternatives lack certain features found in the programs in our main story, such as step-by-step guides, but do offer individual strengths that will appeal to some users.

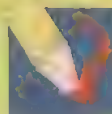
Four stars is the highest rating



INPUT



CORRECTION



EDITING



PROJECTS



OUTPUT

FlashBox 1.0

A creative program designed to make image editing fun, but the nonstandard interface can be confusing. Add-on tools, effects, and styles are offered at additional cost. (\$50 street; Xaos Tools Inc., San Francisco; 800-289-9267, www.xaostools.com.)

HotShots 1.5

If you can operate a TV remote control, you can find your way around this program. Light on features, but gets pictures in and out quickly. (\$50 street; PictureWorks Technology Inc., Danville, CA; 800-303-5400, www.pictureworks.com.)

ixia Digital Camera Suite 1.3

Designed to help business users incorporate images in presentations and Web pages. Version 3.0 will include ixia Explorer, support for specialty papers, and new clip art. (\$70 street; IXIA USA Inc., Danbury, CT; 800-489-6704, www.ixia.com.)

Kai's Photo Soap 1.1

Like FlashBox, Kai's Photo Soap is known for a creative interface that sometimes gets in the way of things. Version 2.0, due by press time, will introduce a more orthodox design. (\$45 street; MetaCreations Corp., Carpinteria, CA; 800-472-9025, www.metacreations.com.)

Mr. Photo Gold 2.0

A suite of programs that are versatile but not well integrated. Each has its own interface making the suite confusing. More appropriate for users with some image-editing experience. (\$80 street; NewSoft America Inc., Fremont, CA; 800-436-4365, www.newsoftinc.com.)

PhotoMAX Image Maker 2.0

An entertaining image-editing program for children. It relies on included add-ons for templates, Web output, and printing. A sister program, PhotoMaxine, is geared specifically for girls. (\$40 street; Polaroid Corp., Cambridge, MA; 800-343-5000, www.polaroid.com.)

SnapShot 1.0

Well-suited to novice users, this new product has a simple, well-organized interface that minimizes the number of mouse clicks required for common operations. (\$40 street; Sierra Home, Bellevue, WA; 800-757-7707, www.sierrahome.com.)

Ulead Photo Express 2.0

\$50 street (\$30 upgrades). Ulead Systems Inc., Torrance, CA; 800-858-5323, 310-523-9393; www.ulead.com; 526 at www.pcmag.com/infoink.

● Ulead Photo Express 2.0 looks and acts like no other product in this story. The program has few of the step-by-step guides or wizards found in competitors, so new users may have difficulty figuring out where to start. Once you get past this initial uncertainty, however, Photo Express is relatively easy to use and offers a well-rounded but somewhat limited set of features.

Photo Express supports Twain-com-

★½

No direct access to cameras and scanners. No batch processing. Opens only five file formats.

★★★★

Easy image acquisition from scanners and cameras, with batch uploads. Links to online photo services.

★★★

Direct camera access for over 120 digital cameras and easy wizard-driven scanning.

★★

Opens only six file formats. No batch downloads to workspace Catalog has no search feature.

★★★

Easily opens many file formats. Single button initialization of Twain scanners and cameras, with batch uploads.

★★½

Supports Twain, batch uploads from cameras, and automatically inserts into current catalog.

★★★★½

Supports many formats and image acquisition via Twain and batch uploads. No Web downloads.

★½

Corrections can be applied using brushes or overall. Commands are buried. No color correction.

★★★

Offers varying degrees of correction control (QuickFix, SmartFix, and Fix By Example). No drop shadows.

★★

Correction tools are limited. All effects are in a single dialog box. Thumbnails are too small.

★★½

Powerful correction tools but not well organized. Confusing.

★★½

Powerful correction tools, but the thumbnail previews are too small. Difficult for novices.

★★½

The display window is tiny. Easy to use and has direct interface for applying corrections or special effects.

★★★★½

Correction tools are simple and effective. Retouching brushes are highly controllable.

★★★

Only three preset brush sizes. Highly artistic typefaces. Great special effects. No gradient. Unlimited undo.

★★½

Small brushes only. You can't subtract from selections. Text is readable, but options are limited.

★½

No brush, gradient, clone, or selection tools. The filters are easy to use. Text can be animated.

★★

Brushes apply effects but not colors. No gradient, selection tools, or compositing of multiple images.

★★½

Good brushes, but no help for novices. Nice set of filters. Selection tools lack edge finders.

★½

Brushes are limited, with no transparency control. Text can't be edited, moved, or resized.

★★

No brushes for applying paint. Good special effects filters. Selection tools work well and include edge finders.

★★½

Templates are varied but tough to find. No guided projects. Clip art is attractive but poorly organized.

★★

Templates limited in power and number. Calendars do not compute proper day/date grid.

★★

Templates are limited. The easy-to-use Web templates resize images for quick download.

★½

No projects. Superb clip art for collaging. You can't save the composition objects for reediting.

★★

Templates and clip art are not high resolution. Photos placed in a template can't be easily moved or resized.

★★½

Lots of family-oriented templates. The clip art tends to hold up well when enlarged.

★★

Some nice templates, including stickers, but offers no calendars. In addition, the templates can be difficult to use.

★★

No multiple-image layouts. Exports to few file formats. No Web features. Slide shows play only in Flashbox.

★★★★½

Multiple-print layouts. Easy e-mail and superb online support, but slide shows can't be exported.

★★

Multiple-print layouts. Focused on photo-album pages and HTML export. Self-executable slide shows.

★

Only two print options: Normal and Greeting Card. Exports to only six file formats. No Web output.

★★½

Multiple-image layouts. Supports only four mail clients. Creates slide shows and self-executable albums.

★★½

No layouts for multiple images. Other modules create e-mail postcards, slide shows, and Web pages.

★★★

No multiple-print layouts. Wizards guide e-mail, slide show, and postcard output.

pliant scanners and digital cameras, as well as batch imports from digital cameras. Photo Express has a built-in link to Kodak Picture Network, and it's simple to add any other service or link to the list. Photo Express includes 1,000 stock photos that are organized into Albums.

For image correction, editing and special effects, Photo Express employs a "Pick-and-Apply" method. Or you can have more precise controls in the custom settings. The red-eye removal tool is not very precise, and the selection tools tend to create hard, jagged edges. But the program includes a good selection of cre-

ative, preset selection areas.

Photo Express contains 300 project templates. One chief flaw of the program is its calendar projects, which can't be saved or sent via e-mail. You can print multiples of the same image in user-defined rows and columns. Photo Express can't print multiple images on a single-page template, however, nor does it support specialty papers. Projects can also be distributed via e-mail or exported as HTML.

Photo Express is a promising program. With the addition of more step-by-step guidance, it could better challenge the top products in this category. **PC**

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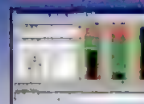
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"Color laser printers have now become affordable enough that some small offices can deploy one as their only shared printer. None exemplify this more than our Editors' Choice in this category, the QMS magicolor[®] 2 CX."

— PC Magazine, May 1998

Best Overall — The QMS magicolor 2 CX

"QMS's relatively low-cost magicolor 2 CX makes a clean sweep in all categories, including best-overall, best-quality, and best-value color laser printer."

— BYTE Magazine, April 1998

The Best Business Printer — The QMS magicolor 2 CX

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— Macworld Magazine,
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PRINT SERVERS

Most departmental and enterprise printers come with their own network connections. If your printer doesn't come ready to share, however, you're not out of luck. One solution is to connect it to the departmental file server via a standard parallel cable. But since parallel cables become unreliable after some 25 feet, you may not be able to place the printer where it is most convenient to users. You can also connect your printers to client PCs in a peer-to-peer scenario, but in order to use those printers, you'll have to make sure the PCs are turned on. And the users of those client systems may suffer mysterious pauses while the PC routes print jobs.

The best way to connect network printers is through a print server, which is a small hardware device with a network connection, par-

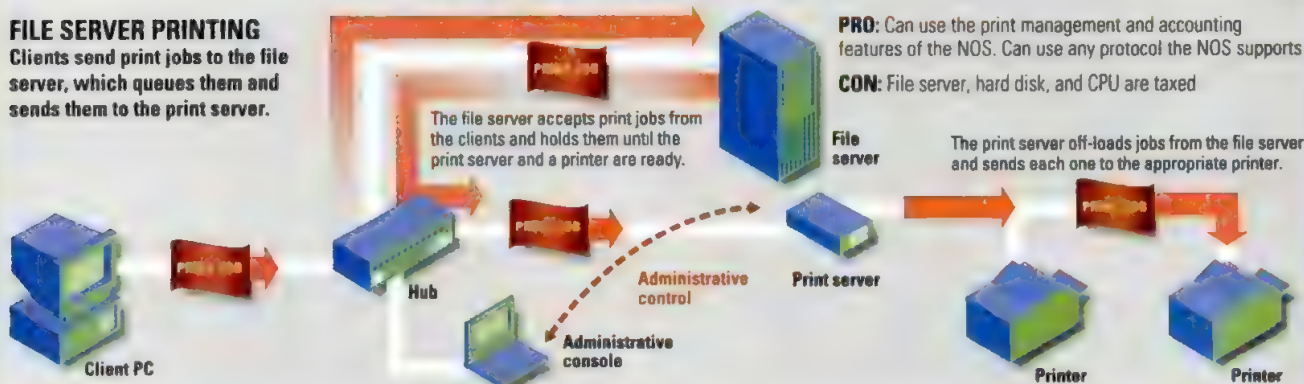
Today's print servers make sharing printers on the LAN easier and less expensive than ever before.

Axis Communications Inc.	185	Intel Corp.	189
Castelle Inc.	185	Lexmark International Inc.	189
D-Link Systems Inc.	186	Linksys Inc.	193
Emulex Corp.	188	Microplex Systems Ltd.	193
Extended Systems Inc.	188	Osicom Technologies Inc.	193
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TWO WAYS TO PRINT

FILE SERVER PRINTING

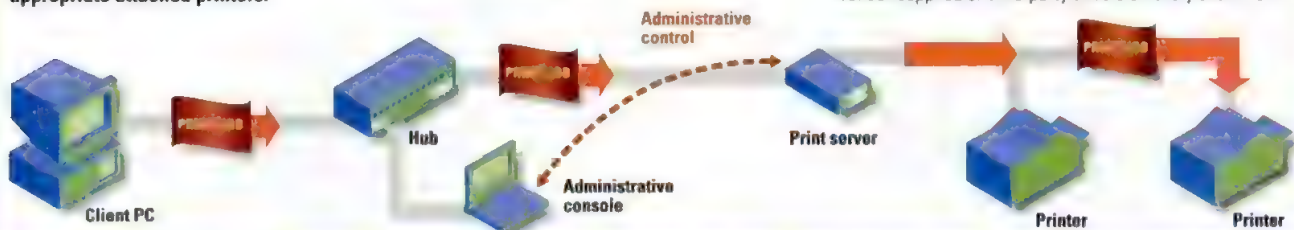
Clients send print jobs to the file server, which queues them and sends them to the print server.



PRO: Can use the print management and accounting features of the NOS. Can use any protocol the NOS supports
CON: File server, hard disk, and CPU are taxed

DIRECT PRINTING

Clients send print jobs directly to the print server, which queues the print jobs and sends them to the appropriate attached printers.



PRO: No file server required. File server, CPU, and hard disk are free for other tasks.

CON: No centralized management and accounting. To print over IP from a Windows 9x client, you must install special vendor-supplied or third-party drivers on every client PC

allel and serial ports, and software that takes print jobs from clients or a server and routes them to the connected printers one at a time. Best of all, since print servers connect directly to the network, they let you place your printers just about anywhere you want.

PLAYERS AND PRICE

In this roundup, we look at 11 network print servers: the Axis PrintPoint 560/100 3P, Castelle LANpress 3P/100, D-Link DP-300, Emulex NETQue PRO2, Extended Systems ExtendNet 100x, HP JetDirect 500X, Intel Netport-Express 10/100, Lexmark MarkNet Pro 3, Linksys EtherFast 3-Port 10/100, Microplex M202 Plus, and the Osicom NETPrint 1000 10/100.

The good news for small businesses and workgroups is that print servers have steadily come down in price since we

looked at them last year. For example, the dual-parallel-port D-Link DP-300 has a rock-bottom price of \$199.

The other good news is that we found these devices easier to set up than ever before. And most of them can be managed remotely either via Microsoft Windows software or over the Web with a standard browser.

WHAT TO BUY

All of the print servers we tested performed well. In fact, we found that the bottleneck in the printing process was not the print server but the printers to which they were connected. The differences among these devices lie in price, the number of printer ports they provide, whether they have Fast Ethernet or just Ethernet connections, and which operating systems and

protocols they support.

Another important difference lies in the type of remote management offered. All offer some kind of Windows-based management utility. Most now also come with Web servers and permit management over the Internet or company network via any standard Web browser. We especially liked the management packages from Extended Systems, HP, and Intel, which were thorough, well organized, and easy to use. HP's excellent JetAdmin

software lets you manage several types of SNMP devices and organize and map them logically by department, group, or capabilities.

Using HP's JetAdmin with HP printers, you also get monitoring capabilities that go beyond the typical basic errors and online/off-line notification to inform you graphically of paper jams, paper out, and the status of toner and other consumables. The same is true when you use the Lexmark print server management soft-

www.pcmag.com

To check out this feature story and our online archive of networking coverage, visit our Web site.

Our Contributors: STEVE RIGNEY is a contributing editor of *PC Magazine*. JEFFREY G. WITT is the technical director for networking and communications, and RYAN SNEDEGAR is a technical analyst at PC Magazine Labs. KEVIN YOUNG was the project leader and executive editor. LEON ERLANGER was in charge of this story.

A woman is shown from the waist up, wearing a black dress with white geometric patterns that resemble a network or circuit. Her arms are outstretched to the sides. The background is a solid blue color.

You have a tough job.
Maintaining a network
isn't easy. Every choice
you make can have
a big impact. Even the
switches you choose.

You don't want
to make a mistake.

So you do what you
always do. Get what
you always get.

A straight line from
here to there.

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threw you a

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and told you
there's something
you might
have missed?

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that gives you
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the product, and free next business

day advance replacement.



4000M

The HP ProCurve 8000M

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capacity to deliver

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total bandwidth.

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To add to the value,
HP ProCurve switches
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manage your network.

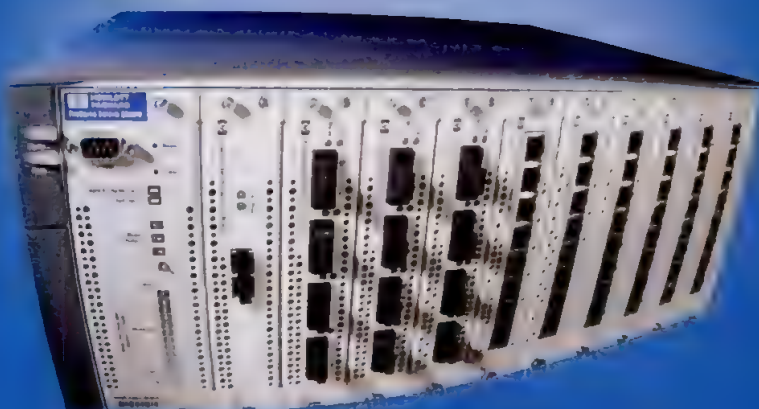
One way is by
finding, fixing and informing
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2400M is a 24 port
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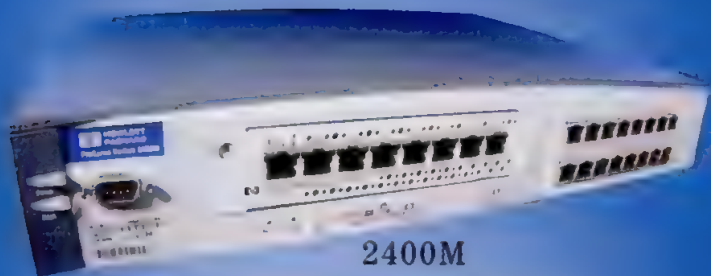
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The HP ProCurve 1600M
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2400M



1600M

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Okay, so
switches
do your network good.
They make it more efficient.
Keep it healthy. Fast. And
—well, we could go on and
on about all the ways

switches are great.
But if you want to
www.hp-procurve.com/procurve.

Then tell your reseller
you'd like to have
a talk with him. Soon.

72 port configuration:

HP ProCurve 4000M	\$99 per port*
3Com SuperStack II 3300	\$169 per port
Bay Networks 450T	\$173 per port
Cisco 2924-XL	\$166 per port

*\$99 per port when \$400 rebate is included.

HP ProCurve 4000M, 8000M, and 2400M prices are based on U.S. list prices effective 11/13/98. HP ProCurve 1600M U.S. list price effective 1/1/99. Savings claims based on U.S. list prices effective 11/13/98 for HP ProCurve 4000M, 3Com SuperStack II 3300, Bay Networks 450T and Cisco 2924-XL switches in 72 port configuration. HP ProCurve 1600M configured with 24 ports. © Hewlett-Packard Company.

ware with Lexmark printers. Interesting to note, the Axis and Extended Systems print servers also work with the HP Web JetAdmin utility.

The Axis PrintPoint 560/100 3P can work as a Novell Distributed Print System (NDPS) device, which lets NetWare clients search for printers on the LAN by location and capabilities (color, paper size, and so forth), as well as automatically install appropriate printer drivers.

All of the servers come with at least two parallel ports, which should be enough for most installations. If you want to connect a third or fourth printer in the same location, the Castelle, Extended Systems, HP, and Linksys products provide a third port. Most also provide serial ports, but these are no longer widely used.

Many of the units also provide 10/100 connections for both Ethernet and Fast Ethernet networks. Only the Emulex and Microplex products were limited to 10-Mbps Ethernet.

And most of the print servers will work over just about any network protocol you have, including AppleTalk, IPX, NetBEUI, and TCP/IP. But make sure you can use the network protocol you want with your NOS. For example, the D-Link DP-300 can print only over NetBEUI under Windows 95 and over IPX under NetWare. The LinkSys product works only over IPX with NetWare and doesn't work with any protocol besides IPX and TCP/IP. This may require you to reconfigure all your Windows 95 clients if they're presently configured for TCP/IP.

PRINTING WITH A NET

A new standard in the works from the Printer Working Group of the Internet Engineering Task Force will let you print to any compliant printer on the Internet, if you have rights to it. Called the Internet Printing Protocol, it will let printers on the Internet serve a similar function that fax machines serve today. Final approval is scheduled for mid-December 1998. Only the HP JetDirect 500X supports the IPP standard today, but HP did not have a client ready for review. IBM currently

EDITORS' CHOICE

• HP JetDirect 500X



All of the print servers we tested performed well and were reasonably easy to set up and configure, but the HP JetDirect 500X represents the best combination

of functionality, management, and price.

For a list price of only \$399, you get a print server with three parallel ports, as well as support for the emerging Internet Printing Protocol and HP's networked all-in-one devices that let you scan directly to print. You also get HP's excellent JetAdmin software which goes a step beyond most print server management packages. JetAdmin lets you manage many different types of SNMP-compliant printers and other HP devices and also organize and map

them graphically by department, location, or capabilities. Combine the JetDirect with some market-leading HP printers and you get detailed information and alerts on consumables such as paper and toner.

We also liked the Intel NetPort-Express 10/100, which also has excellent setup and management software, as well as the Axis PrintPoint 560/100 3P and the Extended Systems Extend-Net 100x, which were easy to use, and can be configured with HP's JetAdmin software in addition to their own Web-based management packages.

offers an IPP prototype client driver as a free download from its Web site (www.printers.ibm.com/ipp/ipp.html). Expect to see printer URLs on business cards in the near future.

Axis PrintPoint 560/100 3P

\$499 list. Woburn, MA; 800-444-2947, 781-938-1188; www.axis.com; 900 at www.pcmag.com/infolink.

● Last year, we liked the PrintPoint 560/100 3P's small footprint, good per-

formance, and easy setup. This year, Axis has added a TCP/IP driver for Windows 9x-based clients and the ability to serve as a Novell Distributed Print System device.

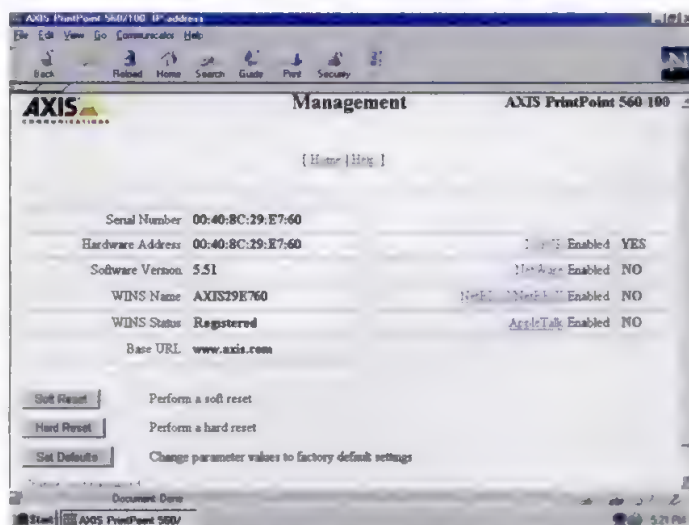
If you already have HP print servers on your network, you can use HP's popular JetAdmin software, which HP packages with its own print servers, to configure and monitor the Axis PrintPoint 560/100 3P. Axis also bundles its excellent

Windows-based NetPilot utility, which automatically looks for Axis print servers and guides you through setup. You can then use any browser to connect to the built-in HTTP server and manage the device.—Steve Rigney

Castelle LANpress 3P/100

\$429 list. Santa Clara, CA; 800-289-7555, 408-496-0474; www.castelle.com; 901 at www.pcmag.com/infolink.

● The most exciting feature of the Castelle LANpress 3P/100 is its Internet Printing package, which lets you produce output by sending e-mail



The Axis PrintPoint 560/100 3P has one of the better Web-based management packages we tested.

SINGLE PRINTER SHARING

The products in our main roundup offer ports for attaching multiple printers to a network. If you have only one printer to attach, you can go with a less expensive single-port server, but otherwise, the buying criteria are the same. You want a product that accommodates your operating systems and network protocols and that is simple to set up and manage. And if you're tight on space, you'll want one with a small footprint. We looked at four of these diminutive devices from Extended Systems, i-Data, Intel, and Linksys. All provide a single parallel port and work in Windows NT and NetWare networking environments. Any of these products will do the job. Your choice comes down to features and price.

EXTENDED SYSTEMS POCKETPRO

Though not much larger than the end of a printer cable, the Extended Systems PocketPro (\$190 street) packs plenty of features, including very good Web-based management. The parallel port of the product can attach directly to the back of your printer, and there's an RJ-45 connector for twisted pair wiring to your 10-Mbps network (but not 100 Mbps). The ExtendView software makes installation and management amazingly simple; printer-condition alerts were the easiest to set up of any product here.

(Extended Systems Inc.; 800-235-7576, 208-322-7576; www.extendsystems.com; 904 at www.pcmag.com/infolink.)

I-DATA EASYCOM ETH 100

Slightly smaller than a cigarette pack, the I-Data EasyCom Eth 100 (\$300 street) takes Web management to the hilt, shunning any additional software. After you plug the unit into the printer, it prints out installation instructions. As with the other



products reviewed here, you can assign IP addresses manually or via DHCP. You can set up e-mail alerts, but the instructions for doing so are sparse. (I-Data Inc.; 516-243-6600; www.i-data.com; 911 at www.pcmag.com/infolink.)

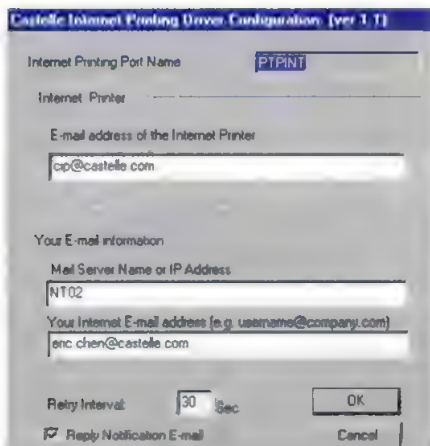
INTEL NETPORT EXPRESS 10/100

We found the installation software of the Intel NetPortExpress (\$260 street) to be

the best of the lot. The Netport, about the size of a paperback book, offers 10- and 100-Mbps connectivity, as well as the obligatory Web server for anywhere management. Besides the RJ-45 and parallel connections, the unit has a test button for troubleshooting and DIP switches if you wish to force the auto-sensing networking to either speed. For additional management, the Netport Manager software offers a drop-down menu that lets you configure alerts to work in conjunction with Intel's LANDesk Management Suite. (Intel Corp.; 800-538-3373, 503-264-7354; www.intel.com; 906 at www.pcmag.com/infolink.)

LINKSYS POCKETPRINT SERVER PPS1

The least expensive product we tested, the Linksys PocketPrint Server PPS1 (\$170 street), fits in your palm and accommodates 10-Mbps networks via a RJ-45 connector, plus a BNC connector for older, thin net coaxial cabling systems. The software is Windows only; there's no Web management. A Wizard-style setup covers the monitoring bases. One minor nit: to configure the unit for peer-to-peer networking, you'll need to install proprietary software on each client. (Linksys Inc.; 800-546-5797, 949-261-1288; www.linksys.com; 908 at www.pcmag.com/infolink.)—Jeffrey Witt



Castelle's LANpress 3P/100 lets you print over the Internet via e-mail.

over the Internet to the print server, thereby providing a capability similar to a fax machine. But though you can use this feature to print over the Internet, the LANpress is not compliant with the Internet Printing Protocol, as is the HP product. Otherwise, the LANpress is a competent three-port Fast Ethernet print server that works with multiple protocols and performs well.

We liked the LANpress's bundled MPAdmin configuration utility but not that it works only over IPX. The LANpress was also the only other print server besides the D-Link DP-300 that does not include Web-based management capability.—SR

D-Link DP-300

\$199 list. Irvine, CA; 800-326-1688, 949-455-1688; www.dlink.com; 902 at www.pcmag.com/infolink.

● The D-Link DP-300 is the least expensive multiport print server we tested. It comes with three ports and can work with most major protocols and OSs. Unfortunately, you don't get the same protocol flexibility as with most of the products we tested. Windows 9x clients can print only using NetBEUI, and NetWare clients are limited to IPX. Only Windows NT clients can print over TCP/IP. Most of the other products in this roundup provide print redirectors that let the client OS print using almost any protocol the print serv-

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SUMMARY OF FEATURES

Print Servers

	Axis PrintPoint 560/100 3P	Castelle LANpress 3P/100	D-Link DP-300	Emulex NETQue PRO2	Extended Systems ExtendNet 100x	 HP JetDirect 500X	Intel NetportExpress 10/100	Lexmark MarkNet Pro 3
■ YES ■ NO								
List price	\$499	\$429	\$199	\$449	\$479	Ethernet 10/100TX version, \$399; Token-Ring version, \$619	\$399	\$409
Street price	\$300	\$340	\$180	\$280	\$320	Ethernet 10/100TX version, \$320; Token-Ring version, \$500	\$330	\$330
Processor type	Axis 32-bit RISC controller	Intel 186	AMD 80186	Intel 186	Intel 386EX	Custom HP ASIC	Intel 486	Hitachi SH2 27MHz
Total memory	2MB	768K	640K	1MB	2MB	4MB	3MB	2MB
Flash memory/Buffer memory	512K / 256K	512K / 256K	512K / 128K	1MB / 64K	1MB / 1MB	2MB / 2MB	1 MB / 2MB	1MB / 256K
Parallel/serial/other ports	2 / 1 / 1	3 / 0 / 0	2 / 1 / 0	2 / 1 / 0	2 / 1 / 1	3 / 0 / 1	2 / 1 / 0	2 / 1 / 0
Dimensions (HWD, in inches)	1.0 x 2.2 x 4.7	1.0 x 9.1 x 5.2	1.0 x 7.4 x 4.5	2.3 x 9.5 x 5.4	2.0 x 8.0 x 6.5	1.2 x 11.0 x 5.0	1.3 x 6.6 x 4.4	1.5 x 10.5 x 5.4
10/100 auto-sensing Ethernet connection	■	■	■	■	■	■	■	■
BootP / DHCP / DNS	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
WINS	■	■	■	■	■	■	■	■
LPD support	■	■	■	■	■	■	■	■
Network Operating Systems								
Windows NT, 98, 95, and 3.x	■	■	■	■	■	■	■	■
NetWare/Unix/Macintosh	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Network Communications Protocols								
TCP/IP / IPX / NetBEUI	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
AppleTalk	■	■	■	■	■	■	■	■
Management Software								
Windows NT, 98, 95, and 3.x	■	■	■	■	■	■	■	■
DOS/Unix	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Embedded Web server	■	■	■	■	■	■	■	■
E-mail notification of errors	■	■	■	■	■	■	■	■
Allows remote resetting of server	■	■	■	■	■	■	■	■
Includes an SNMP agent	■	■	■	■	■	■	■	■
Can be configured through a browser	■	■	■	■	■	■	■	■
Service and Support								
Warranty	3 years	2 years	Lifetime	2 years	5 years	3 years	3 years	3 years
Technical-support hours (eastern time)	9:00–5:15 M–F	9:00–6:00 M–F	9:00–9:00 M–F	24 hours, 7 days	7:00–6:00 M–F	24 hours, 7 days	10:00–8:00 M–F	9:00–9:00 M–F, noon–6:00 Sat

N/A—Not applicable. The product does not have this feature.

er can recognize. We would also like to see D-Link incorporate Web-based management into the DP-300. Still, we found this product easy to install and configure, and its performance was perfectly acceptable, though not top of the line. —SR

Emulex NETQue PRO2

\$449 list. Costa Mesa, CA; 800-368-5391, 714-862-5600; www.emulex.com; 903 at www.pcmag.com/infoclink.

● The Emulex NETQue PRO2 performs reasonably well, but it's one of only two products (Microplex is the other) that can print only over a 10-Mbps connection. The box also contains a BNC connector in case you happen to need the older interface.

There's no quick-start guide; all documentation is on the bundled CD or Emulex's Web site. Luckily for us, the unit was fairly easy to install. The NETQue PRO2 includes a built-in Web server for management and configuration, but we had to download a new version of the firmware to use this feature. And documentation for the Web server interface is online only; the company plans to add this information to the CD.—SR

Extended Systems ExtendNet 100x

\$479 list. Boise, ID; 800-235-7576, 208-322-7575; www.extend-systems.com; 904 at www.pcmag.com/infoclink.

● The Extended Systems ExtendNet 100x is one of the most flexible and easily

installed units we reviewed. The small device has ports for four external printers, along with an auto-sensing 10/100-Mbps Ethernet connector. Note that you can use only three of the parallel ports out of the box. The fourth can work as a serial or parallel port but only with a special cable you buy from the vendor.

We liked the ExtendNet 100x's many configuration options. You can use the bundled ExtendWeb HTML utility or the Windows-based ExtendView for NetWare and TCP/IP. We were even able to use HP's popular JetAdmin and Web JetAdmin to set up print server options. The ExtendNet 100x was also the top performer under both NetWare and Windows NT.—SR

NETWORKING

Print Servers

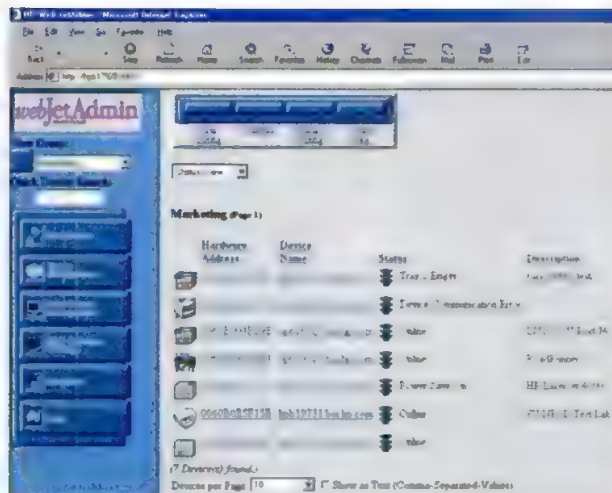
Linksys EtherFast 3-Port 10/100	Microplex M202 Plus	Osicom NETPrint 1000 10/100
\$299	\$795	\$369
\$190	N/A	\$335
AMD 156	Motorola 68340	ARM Risc Processor
896K	3MB	2MB
512K / 128K	1MB / 16K	1 MB / N/A
3 / 0 / 1	2 / 2 / 0	2 / 1 / 0
10 x 90 x 55	13 x 86 x 54	20 x 70 x 40
■ ■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■
■ ■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■
■ ■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■
■ ■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■
■ ■ ■ ■ ■	■ ■ ■ ■ ■	■ ■ ■ ■ ■
1 year	5 years	6 years
10:00-8:00 M-F, noon-4:00 Sat	10:30-7:30 M-F	8:30-7:00 M-F

HP JetDirect 500X

\$399 list. Palo Alto, CA; 800-333-1917, 208-323-2551;
www.hp.com; 905 at www.pcmag.com/infolink.



Our Editors' Choice, the HP JetDirect 500X, comes with Hewlett-Packard's excellent Windows-based JetAdmin and Web-based Web JetAdmin management utilities. JetAdmin and Web JetAdmin automatically detected all of our print servers. Web JetAdmin can be used to monitor any HP or non-HP print server with its own Web server, and both utilities let you arrange and graphically map printers and other SNMP devices in logical groups by department, location, or



HP's Web JetAdmin lets you manage several SNMP devices from a single console.

capabilities. You also get some extra monitoring features when you use JetAdmin with certain HP printers, including paper and toner status.

We were impressed with the product's ability to work with HP's networked all-in-one devices, which let you scan documents directly to the print server across the network. You can also use JetAdmin to configure print servers from Axis and Extended Systems and to manage HP CD-ROM servers.

The JetDirect is also the only print server we reviewed that claimed to comply with the Internet Printing Protocol draft. HP hadn't released its IPP client software in time for testing, however. —SR

Intel NetportExpress 10/100

\$399 list. Hillsboro, OR; 800-538-3373, 503-264-7354;
www.intel.com; 906 at www.pcmag.com/infolink.

● The Intel NetportExpress 10/100 is inexpensive, but it offers only two parallel ports and one serial port versus three parallel ports for the similarly priced HP and Linksys products. We especially liked the NetportExpress's compact size (1.3 by 6.6 by 4.4 inches) and thorough management options. The package comes with excellent bundled Windows software or an SNMP management package and has

all you need for configuring and monitoring the unit using a browser.

Similar to HP's JetAdmin, Intel's management software lets you monitor and group multiple print servers. Its management capabilities, however, do not extend to other Intel and non-Intel devices.

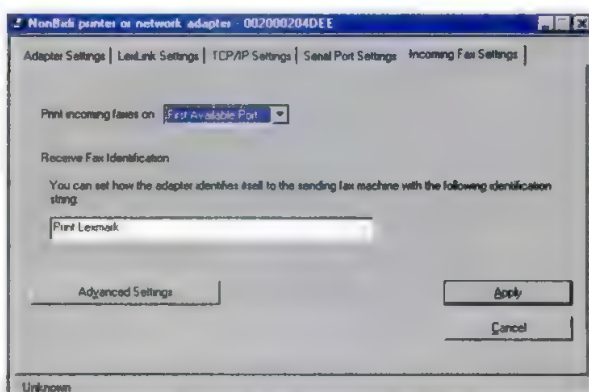
Intel claims that with a 486 processor and 2MB buffer, the NetportExpress is the fastest print server on the market. It wasn't the top performer on our tests, which found printers to be the performance bottlenecks in a real-world environment, but it performed very well.—SR

Lexmark MarkNet Pro 3

\$409 list. Lexington, KY; 800-539-6275, 606-232-2000;
www.lexmark.com; 907 at www.pcmag.com/infolink.

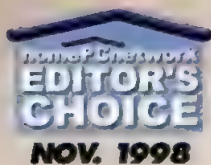
● This is the only product in this roundup that lets you attach a fax modem to its serial port and receive incoming faxes (you can't send a fax). Used together with Lexmark printers and the included management utilities, you can also receive detailed alerts via graphical representations of the connected printers, making the MarkNet a must in networked Lexmark printer environments. Otherwise, the Lexmark is typical of the products reviewed here, with two parallel ports and good protocol support.

We liked the detailed, multilingual documentation, but we found the bundled



The Lexmark MarkNet Pro 3 lets you receive faxes via a fax modem attached to the serial port.

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BENCHMARK TESTS

Print Servers



All the products we tested performed well. The printer, not the print server, typically is the performance bottleneck.

We used the fastest printers we could find—a 34-ppm Lexmark Optra S 3455 with 8MB of RAM and a 17-ppm HP LaserJet 4000 with 24MB of RAM—in order to make the print server work as hard as possible. Still, we found only a 20 percent variation between the fastest and slowest products. Buffer size, processor speed, and the Ethernet port speed had no significant effect on performance. For example, the Intel NetportExpress 10/100 featured an Intel 486 chip, and the Extended Systems ExtendNet 100x had a 386; yet they had similar output times.

Pooling the printers together in a single queue let Windows NT and NetWare send most of the print jobs to the Lexmark Optra, the faster printer. This resulted in faster printer performance than when we divided the print jobs into two queues, which used the slower printer, the HP LaserJet 4000, more often. We were forced to print results from two queues in Windows NT, however, because single-queued results varied significantly from one test to another. The Microplex M202 Plus in particular had problems handling Windows NT, at first taking over an hour to print using two print queues. Microplex suggested we abandon its driver and try the generic Windows LPR ports instead, which remedied the problem.—*Analysis written by Martin Wong*

How We Tested

We tested the print servers using a variety of test files, including 6-page Excel, 5-page Word, 35-page Word, 5-page PDF, and 10MB TIFF files. We tested under Novell's IntranetWare 4.11 with Support Pack 5B, and Windows NT with Service Pack 3. We installed the NOSs on identical Compaq 1600R servers with dual 266-MHz Pentium II CPUs and 512MB of RAM. Our clients were eight Dell OptiPlex GXAs with Pentium II/233-MHz processors and

PRINT SERVER THROUGHPUT

Low scores are best. Minutes:seconds
Bold type denotes first place within each category.
■ denotes Editor's Choice.

NETWARE 4.11	
Axis PrintPoint 560/100 3P	5:05
Castelle LANpress 3P/100	5:34
D-Link DP-300	4:51
Emulex NETQue PRO2	5:53
Extended Systems ExtendNet 100x	4:42
■ HP JetDirect 500X	5:00
Intel NetportExpress 10/100	5:05
Lexmark MarkNet Pro 3	4:58
Linksys EtherFast 3-Port 10/100	5:35
Microplex M202 Plus	5:14
Osicom NETPrint 1000 10/100	4:50
WINDOWS NT SERVER 4.0	
Axis PrintPoint 560/100 3P	6:47
Castelle LANpress 3P/100	6:44
D-Link DP-300	6:36
Emulex NETQue PRO2	6:40
Extended Systems ExtendNet 100x	6:19
■ HP JetDirect 500X	6:37
Intel NetportExpress 10/100	6:43
Lexmark MarkNet Pro 3	6:35
Linksys EtherFast 3-Port 10/100	6:49
Microplex M202 Plus	6:41
Osicom NETPrint 1000 10/100	6:44

32MB of RAM, eight Dell Dimension XPS Pro200ns with Pentium Pro/200 processors and 32MB of RAM, and eight Dell Dimension XPS P166s with Pentium/166 processors and 32MB of RAM, each running Windows 95. The PCs were connected by SynOptics 28115 Fast Ethernet switches. A connection through a 3Com Superstack II Hub 100TX let us capture network data.

For NetWare, we printed using NDS in Pconsole mode. We used TCP/IP native drivers if available; otherwise, we used LPR. The printers on the test-bed were a 34-ppm Lexmark Optra S 3455 with 8MB of RAM and a 17-ppm HP LaserJet 4000 with 24MB of RAM.

When we printed to two queues, we used each printer's proprietary driver, but when we pooled the printers into one queue, we used the standard HP PCL 5 driver. In Windows NT, we were able to pause the queue and load up all of the print jobs. We measured the time it took from removing the print-queue pause to finishing the final output page on the last printer finished. For NetWare, we started timing when the clients clicked the Print button and ended with the completion of the last page. For all of the tests, we used a protocol analyzer to capture the network traffic between the print server and the NOS client.

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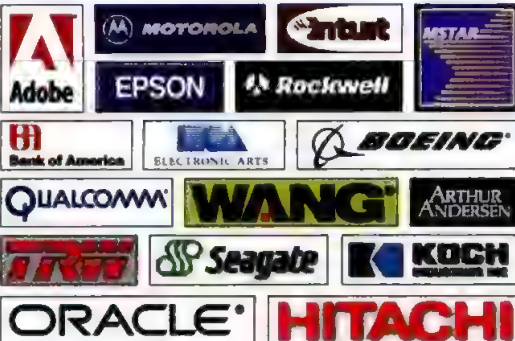
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Windows- and Web-based management software a little less easy to use than HP's JetAdmin.—SR

Linksys EtherFast 3-Port 10/100

\$299 list. Irvine, CA; 800-546-5797, 949-261-1268;
www.linksys.com; 908 at www.pcmag.com/infolink.

● At \$299 list (\$190 street), the Linksys EtherFast 3-Port 10/100 is the least expensive print server we tested that offers three parallel ports and a 10/100-Mbps connection. Unfortunately, the EtherFast works only over IPX and TCP/IP, and it lacks browser-based management. Unless you're looking to save a quick \$100, you'll find better flexibility in products from HP, Intel, or Extended Systems.

The bundled Bi-Admin program is not as detailed as those of other packages, but it let us monitor multiple devices and configure our EtherFast as both a NetWare and a Windows NT-based print server. Bi-Admin also automatically detects any EtherFast devices on your network without any prior configuration. Like the D-Link DP-300, the EtherFast works only

with IPX for NetWare clients, but unlike its competitor, the EtherFast lets you print from Windows 9x using TCP/IP.—SR

Microplex M202 Plus

\$795 list. Burnaby, B.C., Canada; 604-444-4232, 800-665-7798; www.microplex.com; 909 at www.pcmag.com/infolink.

● The Microplex M202 Plus is the only product that shipped with fiber-optic connectors, yet it's also one of only two products that can only connect to the network at 10-Mbps Ethernet. And if you opt for an AUI connector instead of fiber, the price is still a whopping \$575 (list)—far higher than any other unit in this roundup. Unfortunately, the price is not justified by features.

We ran into some performance problems when using the bundled Windows NT driver. Microplex recommended that we use the LPR printer driver with Windows NT, which brought performance in line with the other products we tested. The included configuration utility is easy to use but not on a par with that of the HP or Intel products.—Ryan Snedegar

Osicom NETPrint 1000 10/100

\$369 list. Waltham, MA; 800-243-2333, 781-847-1234;
www.osicom.com; 910 at www.pcmag.com/infolink.

● Though not a standout, the Osicom NETPrint 1000 10/100 works as advertised. The setup utility doesn't automate NetWare configuration as much as most of the other products we tested, but setup is not overly complicated. The Osicom is the only product here with no buffer, so you need to print via a file server.

Osicom comes with browser-based management and includes an IPX-based browser for networks that don't use IP. At 100 Mps, the NETPrint unit we received could not use DHCP or BootP for an IP address assignment, but Osicom claims the problem will be fixed by the time you read this. The product comes with only a single LED to display status; we prefer the multiple LEDs you get with the Lexmark and Microplex products.

The NETPrint performed well, particularly with NetWare.—RS PC

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The Expansion Bus



This vital but unheralded component has been around about as long as the PC itself. We take a look at what makes it tick.

By Alfred Poor

If the components in your computer are going to play a part in the processing, they've got to get connected.

When most users hear the term *bus*, they tend to think in terms of expansion slots. In fact, there are many kinds of buses in a computer, serving similar but different functions. In its simplest sense, a bus is a set of electrical connections that allows two or more devices to communicate. For example, the system bus is the series of connections between the central processing unit (CPU) and the system memory, among other components. This operates at the external clock speed of the processor. (The clock speed determines how many actions, such as memory reads or writes, can take place each second.)

Expansion buses are designed to make it easier to connect devices to the computer system. In the early days of microcomputers, the S-100 bus was widely used on CP/M systems. The Apple II was based on a proprietary design and had the first expansion bus that made it easy for end users to add cards on their own.

The idea of an open architecture based on a simple expansion bus was one of the factors that helped launch the first IBM PC's overnight success. After more than 16 years, you can still fit original PC Cards in today's computers, which is a tribute to the staying power of the design (if not of its engineering excellence).

Since that original start in 1982, personal computer expansion buses have evolved in many significant ways. There have been some dead branches on the family tree along the way (Micro Channel Architecture, VL-Bus, and EISA may be the most familiar), but there has been remarkably broad acceptance across the industry for standard expansion bus designs.

In fact, if you look in any typical Pentium II system, you are likely to find one of three different expansion bus designs, as shown in the illustration.

ISA BUS

The heart of the Industry Standard Architecture (ISA) bus is the same 8-bit bus that originally debuted on the IBM PC. At that point, it ran at the same speed as the system bus—a not-so-blazing 4.77 MHz—and when the 16-bit extension was added for the IBM AT, it kept up to speed with the system bus first at 6 MHz and later at 8 MHz. AT clones started to run with faster processors, but it was soon discovered that many expansion cards could not keep up, so the industry standardized on the 8-MHz speed. While other bus

USER TO USER



Recovering missing drive partitions; using Microsoft Word to create PowerPoint slides; changing CMOS settings; automating Windows log-on; moving Word 87 AutoCorrect entries; transposing ranges in Excel; and more. *Page 197.*

UTILITIES



InCtrl4 is the latest version of the popular utility that aids in uninstalling programs. InCtrl4 records which files were added or modified and tracks registry and INI file changes, and it does it faster than ever. *Page 208.*

INTERNET USER



Dynamic HTML has the power to produce attractive, interactive Web sites, but browser incompatibilities have kept it from realizing its potential. We touch on some DHTML, CSS, and scripting basics, and offer tips for writing DHTML pages that will work in both Microsoft Internet Explorer and Netscape Navigator. *Page 212.*

PC TECH



New features make Microsoft Visual C++ 6.0 Enterprise Edition an essential upgrade for Visual C++ 5.0 users, and improved ease of use makes it an attractive choice for beginning and intermediate programmers as well. *Page 215.*

More on the Web:

You'll find all of the articles, examples, and code files in this section at PC Tech online.

www.pcmag.com/pctech

designs (such as the VESA Local Bus, also called the VL-Bus) have been directly tied to the system bus speed, most expansion buses use a speed independent of the system bus.

The 8-bit-wide 4.77-MHz IBM PC bus had a peak throughput rating of about 2 megabytes per second. Bringing the speed up to 8 MHz and adding the 8 additional data lines to make 16 bits increased the maximum throughput to 8 MBps. The 8-bit extension made it possible for computers to address 16MB of memory (up from the original 1MB address space), but addressing the additional 8 bits is not as easy as addressing the original 8-bit design, because memory access operations above the first megabyte require two steps.

As processors became faster and gained wider data paths, the basic ISA bus design did not change to keep pace. Even now, most ISA cards remain 8-bit. The few types with 16-bit data paths—hard disk controllers, graphics adapters, and some network adapters—are still constricted by the low throughput levels of the ISA bus, and these processes can be better handled by expansion cards in faster bus slots.

ISA expansion slots are present in systems as a link to the past, though their use may be coming to an end. The parallel and serial ports, which used to reside on such cards, are now integrated into most motherboards. And Intel and Microsoft are trying to help pull the plug on the ISA bus: The require-

ments in the PC 99 System Design Guide, a specification for general-use PC configuration, call for no ISA slots.

PCI BUS

With the advent of Pentium processors and their higher processing speeds, it became clear that the slow and narrow ISA bus would become a bottleneck between the processor and expansion devices. The Peripheral Component Interconnect (PCI) bus was created by Intel to solve this problem.

Unlike the VL-Bus, which was designed to run at system bus speeds, the PCI bus was created as a "mezzanine" bus, running at its own clock speed separate from the system bus speed. Originally specified as a 32-bit-wide bus operating at 33 MHz, PCI had a theoretical maximum transfer rate of 132 MBps—16.5 times as fast as the ISA bus's—and this is the version most widely implemented in PC systems. PCI also simplified system configuration by supporting plug-and-play, and it extended the limited resources of the original PC-compatible hardware by supporting shared IRQ assignments.

The original 124-pin slot specification (62 pins on each side of the expansion slot) has been revised to support even greater throughput. First, a 64-bit extension was designed using an extended connector much like the 16-bit addition to the ISA bus,

adding another 64 contact pins (32 pins per side). This doubled the theoretical throughput (though 64-bit cards are still rare at this point).

More productive is the PCI 2.1 specification, which calls for a 66-MHz bus speed. This effectively doubles the theoretical throughput of the original 32-bit specification to 264 MBps—33 times as fast as with the ISA bus.

Along with the 64-bit version, there are some other aspects of the PCI specification that most users may not know about. For example, PCI cards can run on either 5 volts or 3.3 volts. A 5-volt card has a notch cut into the edge connector toward the front of the computer case, with a corresponding key in the slot. A 3.3-volt card has a notch toward the rear of the case, with a corresponding key in the slot. This prevents a user from accidentally plugging the wrong card into a slot. The PCI specification also calls for a universal card, which fits either slot and runs on either voltage.

Another less-known trait of the PCI expansion slot is that the bus is limited to ten electrical loads. Most cards apply more than one load to the bus, and as a result, the practical limit for expansion cards on a single PCI bus is three cards (in some cases, four will work). If you need more than three PCI cards installed in a single system, you can have more than one PCI bus, using a *PCI bridge* configuration.

Talking It Out

An expansion bus allows a component—such as a video card, disk controller, modem, or parallel-port card—to communicate with the computer. Three common types of buses are ISA, PCI, and AGP. Each has its own kind of *slot*—the interface between a card's edge connectors and the main system board.

ISA slot

The ISA bus goes back to the first-generation IBM PC. Most ISA cards are still 8-bit and run at a leisurely 8 MHz, creating performance bottlenecks on machines with modern high-speed processors.

AGP slot

The AGP bus is strictly for graphics and can run at up to 133 MHz. This specialized design combined with direct access to system memory provides extremely high throughput.

PCI slot

The PCI bus runs at its own clock speed—up to 66 MHz—rather than the system bus speed. It also has a data path of up to 64 bits and supports plug-and-play and shared IRQ assignments.

AGP BUS

As fast and wide as the PCI bus may be, there is one task that threatens to consume all its bandwidth and still ask for more: graphics display.

In the days of the original ISA bus, we used the relatively simple Monochrome Display Adapter (MDA) and Color Graphics Array (CGA) cards to drive our monitors, and these required relatively small amounts of data. A CGA graphics display could show four colors (2 bits of data) at 320-by-200 resolution at 60 Hz, which required 128,000 bits of data per screen, or just over 937 kilobytes per second.

In contrast, an XGA image at 16-bit color depth requires 1.5MB of data for every image, and at 75 Hz, this data is required 75 times per second. Thanks to graphics accelerators, not all of this data has to be transmitted across the expansion bus to the graphics card, but new imaging technology has created new problems.

Now 3-D graphics have made it possible to model both fantastic and realistic worlds on-screen with amazing detail. Texture mapping and object hiding require enormous amounts of data, and the graphics adapter needs to have fast access to this information.

Enter the Accelerated Graphics Port (AGP), which appeared with Pentium II mother-



boards. It barely conforms to our original definition of a bus, as it is really a *point-to-point* connection, dedicated to the single task of connecting a graphics adapter more directly to the motherboard's resources.

Along with its limited role, AGP has limited capabilities. PCI devices must support communication with a variety of devices—storage adapters, network connections, and sound cards, for example—but AGP deals only with graphics. This single-direction, limited task makes it possible to streamline the design for maximum speed.

The speed is used to give the graphics adapter fast access to texture and buffer data. Instead of loading up the graphics card with expensive memory, AGP lets the card access this information directly from the computer's system memory, without involving the CPU in the process.

How much faster is AGP than PCI? A 33-MHz 32-bit PCI bus supports up to 132-MBps throughput. AGP is also a 32-bit design, but it

runs at speeds up to 133 MHz—four times as fast—so it has a maximum transfer rate of 532 MBps. (This is still twice as fast as the rate of a 66-MHz 32-bit PCI bus.) Best of all, however, is that the graphics card on the AGP bus does not have to compete with any other devices to get access to its data.

There are some important implications for this design. You can have only one AGP device in a system at a time. If you want to use a second display (a feature that Windows 98 makes relatively easy to implement), you will need to rely on a PCI graphics adapter for the second display. If you want to upgrade an AGP display, you will need to replace the adapter.

As with PCI, there are some lesser-known details contained in the AGP specification. Just as there are two different PCI slot designs depending on the card voltage, so there are two different voltage designs for AGP, the common 3.3-volt design and a 1.5-volt type.

As demand for ever faster throughput continues, we're likely to see even higher clock speeds, wider data paths, and other speed-enhancement strategies in the future. 

Alfred Poor is a contributing editor of PC Magazine.



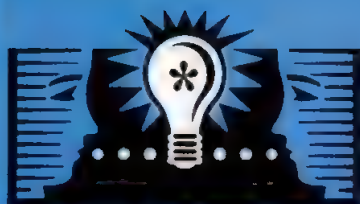
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USER TO USER

The Case of The Missing Drives

Several months ago I installed a new 8.4GB drive, but after I partitioned and formatted the new drive, Windows 95 showed me only my original drive and the primary partition on the new one. I had "lost" the other 3 partitions, as well as my CD-ROM drive! I spent several days digging unsuccessfully through technical articles, then a friend suggested I look at TweakUI, the Microsoft Power Toys utility, because he had just installed it and remembered being able to disable the reporting of drive letters. As soon I heard this I remembered doing exactly that, when I installed the utility a year ago. I quickly revisited TweakUI, now all my drives were listed and operating as expected. It just goes to show that it's not always Windows 95's fault!

Lanny Lister
Knoxville, Tennessee

PC If your system is plagued with missing drives, download the Power Toys utility set from ZDNet's www.hotfiles.com, or from almost any large download site. Install TweakUI, launch it from Control Panel, and click the *My Computer* tab. You'll see a list of drive letters from A: to Z:, with a check box and an icon next to each as shown in Figure 1. An icon with a red X below the drive indicates that no drive with that letter is accessible. Any accessible drive that has a check in its box will be displayed in Explorer, so just check all the boxes. If you're a Regedit expert, navigate to `HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Policies\Explorer`, and set the *NoDrives* value to 00,00,00,00.

Why does Windows even have a provision for hiding valid, accessible drives? The answer comes from DriveSpace, the disk compression utility. When DriveSpace compresses an entire drive, the newly compressed drive takes the original drive letter, and the host drive (the original, uncompressed drive) gets a new

letter. It's almost never necessary or useful to access the host drive directly, so DriveSpace permits you to hide the host drive. The screen shot in Figure 1 was snapped on a system whose C: and D: drives are compressed and use hidden host drives I: and J:.

Most of the time the missing drive problem arises when you add a new hard disk to the

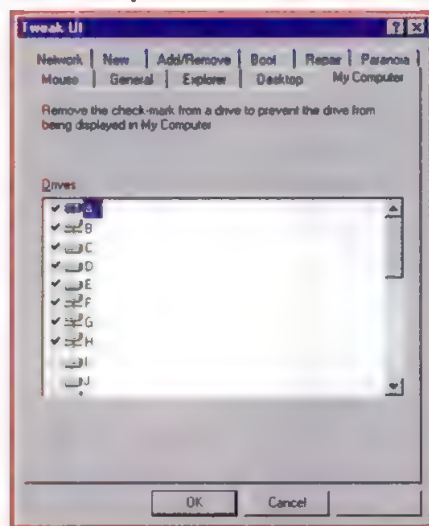


FIGURE 1: Has one of your drives gone missing? TweakUI can bring it back into view.

system, bumping an existing drive to a different drive letter. If that letter is one that has been hidden, the drive simply won't show up in Explorer.—Neil J. Rubenking

Use Word to Create PowerPoint Slides

Typing text into Microsoft PowerPoint slides is a tedious chore compared with creating the text in Microsoft Word, particularly if your presentation is mostly text. On my office system, which is running Word 97 and PowerPoint 97, I usually take advantage of Word's *File | Send To | Microsoft PowerPoint* feature to let me type the text in Word, then send it to PowerPoint all at once.

However, my notebook system, which I use at home and when traveling, has Word 7 and PowerPoint 7, and I've yet to find an equivalent command in Word 7. Is there one, or am I stuck with the choice of either creating presentations in PowerPoint or upgrading my notebook?

Tim Tyler
via the Internet

PC It's actually just as easy in Word 7 as in Word 97 to create text for slides and then move it to PowerPoint. However, you won't find the feature on a menu. Start by creating the text in Word 7 in Outline, Normal, or Page view. As with Word 97, use a Heading 1 style to indicate the title for each new slide, and use lower-level headings for subordinate text, going down as many levels as you want to use on the slide.

When you're finished creating the text in Word 97, you can use the *File | Send To* command as Mr. Tyler suggests. With Word 7, open a PowerPoint window with a new, blank presentation, and choose *View | Outline*. Go to the Word window, select the entire file with *Ctrl-**<**Numpad 5>*, and choose *Edit | Copy*. Then go back to the PowerPoint window and choose *Edit | Paste*. Finally, switch to slide view in PowerPoint, and format or add to the slides.

Note that whatever view you're using—and whether you're using Word 7 or Word 97—the easiest way to attach a heading style to any given paragraph, or change the style, is with the keystroke combination of *Alt-Shift* plus the *Left* or *Right Arrow* key.

Alt-Shift-Left Arrow will change the style for a paragraph from Normal to a Heading style, using Heading 1 if there is no Heading above the current paragraph, or matching the rank of the closest heading style earlier in the file. If the paragraph is already formatted with a Heading style, *Alt-Shift-Left Arrow* will move the Heading rank up by one—from Heading 3 to Heading 2, for example.

Alt-Shift-Right Arrow will change a Normal paragraph to Heading 2 if there is no heading above the current paragraph, or one lower than the rank of the closest heading style earlier in the file. If the paragraph is already formatted with a Heading style, *Alt-Shift-Right Arrow* will move the paragraph's Heading rank down by one—from Heading 1 to Heading 2, for example.

You can also use *Alt-Shift-Up Arrow* and *Alt-Shift-Down Arrow* to move the paragraphs up and down physically, one paragraph at a time. And, for the sake of completeness, note that *Alt-Shift-**<**Numpad 5>*—that's 5 on the numeric keypad—will change a paragraph from a Heading style to Normal.—M. David Stone

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Can't See the CMOS

I have an older desktop system, and I want to install a different hard disk. This means I must change the settings in the system's CMOS configuration, but I can't get to the setup utility. The system doesn't give the usual prompt to "press Del to enter setup" during the boot-up process, and I can't find any key combinations that do the trick. Do you have any suggestions?

Jim Yates
via the Internet

PC One way to solve this problem is to see whether a hotkey that loads a CMOS editor in the system's ROM is available. The instruction to press the Del key during boot-up is commonly used by systems with AMI or Award BIOS. Other keys to try during the

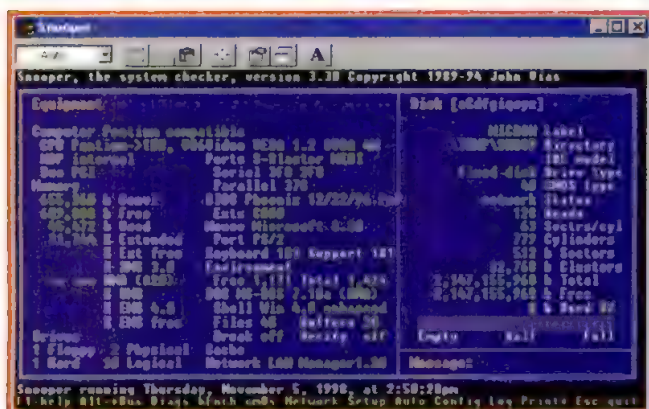


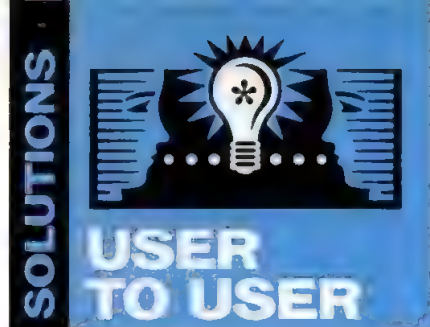
FIGURE 2: Snooper is a shareware generic CMOS editor.

boot process are Esc (some Toshiba systems), F1 (some Toshiba systems and some using Phoenix BIOS), F2 (some NEC systems), F10 (some Compaq systems), and Ins (some IBM PS/2 models). On some Dell systems, you can press the Reset button twice.

Other systems have hotkeys that are available at any time. Ctrl-Alt-Enter works on some Dell systems. Ctrl-Alt-? works on some IBM PS/2s, Ctrl-Alt-Esc for some Award BIOS systems, Ctrl-Alt-S for some Phoenix BIOS systems, and Ctrl-Alt-Ins for some other Phoenix BIOS systems.

If none of these hotkeys work, it may be that your system requires an external CMOS-editing utility, which used to be typically supplied on a separate setup disk; this was the case with the original IBM AT, for example, as well as many older Compaq systems. Contact the manufacturer (if it is still in business) and see whether the utility is still available. In some cases, you may be able to download the required files from the company's Web site.

If all this fails, you may still be able to make the changes you need. Because all



system BIOS code is more or less compatible, the CMOS memory stores all the fundamental configuration data in the same format. As a result, you can use an editor to view or modify some of that standard content, even if you don't know what type of BIOS the system has. Some commercial diagnostic utilities include CMOS-editing features, but if you look around, you can also find shareware and freeware utilities that can also work. For example, there's a DOS utility, called Snooper (shown in Figure 2), that can still be found

at a number of sites on the Web for downloading (including

www.hotfiles.com).

No matter which approach you take, be sure to back up any data or programs that you can't afford to lose, just in case something goes wrong and you end up with a lobotomized system that won't reboot. It's not likely that this will happen, but it can't hurt to take some precautions before you

make changes to the CMOS configuration settings.—*Alfred Poor*

Automate Log-On In Windows

Windows NT 4 Workstation requires manual keyboard input in order to complete its log-on procedure. For the home user, this is intrusive and absurd, and there ought to be an easily found option to disable it. (In fact, I would argue that it ought not to be the default condition.) I've found that TweakUI, a Microsoft utility, does offer a switch for enabling automatic log-on, but for the setting to stick, there are certain conditions. One of these is that you must first select a password; automatic log-on won't work if your password is blank.

If you left the password field blank when you installed Windows NT, a default password may have been provided. This must be changed to one of your choosing before you can have the system do an auto-log-on. To do this, use *Start / Programs / Administrative Tools / User Manager*. When the User Manager comes up, you'll see the *Administrator* line outlined. Press Enter to open

the *User Properties* box. There, you can change the default password. In order to have the system retain your password, you must exit User Manager and reboot. Once this is done, you can use TweakUI to set the system to auto-log-on.

Jules Brenner
via the Internet

PC Here's another case of TweakUI to the rescue; every Windows 95 and Windows NT 4 user should have it. You can download the collection from www.hotfiles.com or from almost any download site. Automating your Windows log-on is one among dozens of tweaks you can perform with the Power Toys utilities. And this particular tip isn't limited to Windows NT 4; it works just as well in Windows 95. Launch TweakUI from Control Panel, click the *Network* tab, check the *Log on automatically* box, and fill in your user name and password.

For those who like to know, automating log-on with TweakUI simply changes some settings in the registry. In Windows NT 4, the affected key is HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion\WinLogon. In Windows 95 it's almost the same—HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\WinLogon. In either case, the settings involved are three named string values in the WinLogon key, DefaultUserName, DefaultPassword, and AutoAdminLogon. The data strings for these three values are, respectively, your user name, your password, and "1".

Do note that when you enable automatic log-on, the default password is stored in the registry without any encryption or other protection. Anyone who has access to your machine can run RegEdit and learn the password. This tip is best used on a home computer, or perhaps in an office that's always locked when the occupant is not present. One more point: If you use TweakUI to turn off this feature, it's not enough to uncheck the *Log on automatically* box. You should also erase the contents of the *Password* box as well or your password will remain visible to anyone perusing your registry.—*Neil J. Rubenking*

Moving Word 97 AutoCorrect Entries

I have a large number of words that I commonly misspell entered on my desktop system as Word 97 AutoCorrect entries. I'd like to copy these to my notebook without having to reenter them all. However, I can't find the file that holds the AutoCorrect database. Can you point me in the right direction?

Andy Adkins
via the Internet



PC According to Microsoft, the AutoCorrect information is stored partly in the registry, partly in the Normal template, and partly in a file called *Username.acf*, where *Username* is the user name you log on with. It's possible to copy the files and appropriate registry entry to another computer manually and then modify the registry and rename the files—and indeed, that was the only choice for Word 7. However, that isn't the best approach with Word 97.

The preferred approach for Word 97 is to use the AutoCorrect backup-and-restore macro, which ships with Word. The macro, which goes by the name *AutoCorrectUtility*, works by converting the AutoCorrect entries to a Word document on the source computer, then converting the text in the document into AutoCorrect entries on the target computer. This has several advantages. The two most important are that it bypasses the need to work with the registry, and it adds to the entries you already have on the target computer rather than replacing all the entries wholesale. I'll cover only the preferred approach here, but I'll revisit this issue to explain how to do this with Word 7 if there are enough requests.

To use the macro, you first have to make sure you installed the file *Macros8.dot* on both systems. It should be in the *Office\Macros* directory. If it isn't, you can install it by rerunning Setup. Go to the Control Panel (*Start | Settings | Control Panel*) and choose *Add/Remove Programs*. Select *Microsoft Office 97*, choose *Add/Remove*, put the Office CD-ROM in the drive when Setup tells you to, and choose *OK*. Next, choose *Add/Remove*, highlight *Microsoft Word*, choose *Change Option*, and add a check to the *Wizards and Templates* check box. Choose *OK* and then *Continue* and Setup will add the file to your disk, along with a number of other wizards and templates.

Load Word on the source system. Choose *Tools | Templates and Add-Ins*, then choose the *Add* button to open the *Add Template* dialog box. Navigate to the *Office\Macros* directory, highlight *Macros8.dot*, and choose *OK*. Word will return you to the *Templates and Add-Ins* dialog box, with *Macros8.dot* now added to the *Global Templates and Add-Ins* list. The *Macros8.dot* item should be checked. Choose *OK* and you'll return to the document you started from, with a new toolbar consisting solely of a drop-down list labeled *Sample Macros*.

To create the document to move to the second computer, choose *Sample Macros* to open the drop-down list, and then choose *AutoCorrectUtility* from the list. The macro will show you a dialog box with buttons labeled *Backup*, *Restore*, and *Cancel*. Choose *Backup* to generate the list of AutoCorrect entries and insert

them into the document. When the macro is finished, it will prompt you to save the file, suggesting the name *AutoCorrect Backup Document.Doc*. Accept it or change the name, and choose *Save*. You'll return to the original dialog box for the macro. Choose *Cancel* to close it.

Next, copy the AutoCorrect backup document to the target computer. Start Word, use the *Tools | Templates and Add-Ins* command to open *Macros8.dot* as a global template, and run the *AutoCorrectUtility* macro, just as you did on the source computer. This time, however, choose *Restore*.

The macro will remind you that restoring from the file will replace any AutoCorrect entries of the same name, then ask whether you want to continue. Choose *Yes*. Navigate your way to the backup document, select it, and choose *Open*. The macro will run through the document, creating AutoCorrect entries and updating the status line as it goes. When it's done, you'll see a dialog box with the message "Restore Complete." Choose *OK* and you'll return to the original dialog box for the macro. Choose *Cancel* to close it and you're done. At this point, you should have all the AutoCorrect entries from the source system plus any that you had on the target system to begin with—except for entries that had the same name on both systems. For any that shared the same name, the entries from the source system will have overwritten the entries on the target system. —M. David Stone

Sum Ranges Conditionally

I have a spreadsheet that tallies operator rejects by reject code numbers. Each cell in the right-hand column has a reject code, and the corresponding cell to the left has the quantity of that type of reject (see Figure 3). The rows contain order information from individual shops. I

can use *COUNTIF* to tote up the number of times that an error code appears in the right-hand column, but I also need to multiply the number of appearances of each error code by the number of errors for that code in the column to the left. Is there a way to do this?

Phil McCole
South Barre, Massachusetts

PC Sounds like a job for *SUMIF*, not *COUNTIF*. As you say, *COUNTIF* lets you tally the number of occurrences of a particular value within a range. But *SUMIF* lets you total the number of cells in a range for which the corresponding cells in some other range have a specified value.

In Figure 3, the range B2:B17 contains your reject codes and the corresponding cells in A2:A17 report the number of occur-

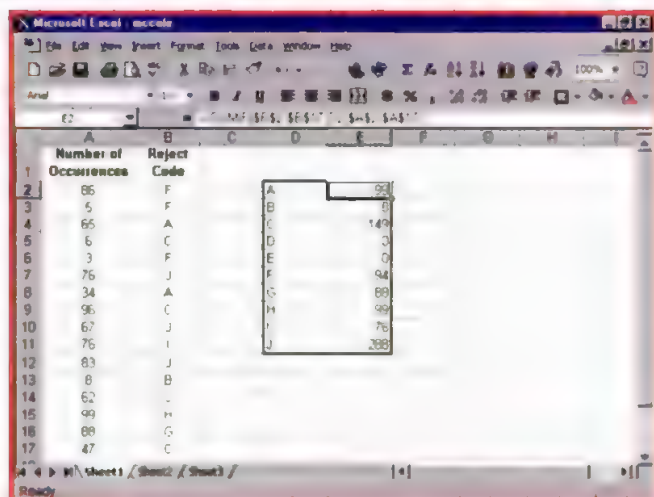


FIGURE 3: To add up all the values in column A whose result codes in column B are "A," you can use the *SUMIF* formula in cell E2.

rences of each reject code. To total the values of the cells in column A whose corresponding cells in column B equal "A," you could write the following:

=SUMIF(B2:B17,"A",A2:A17)

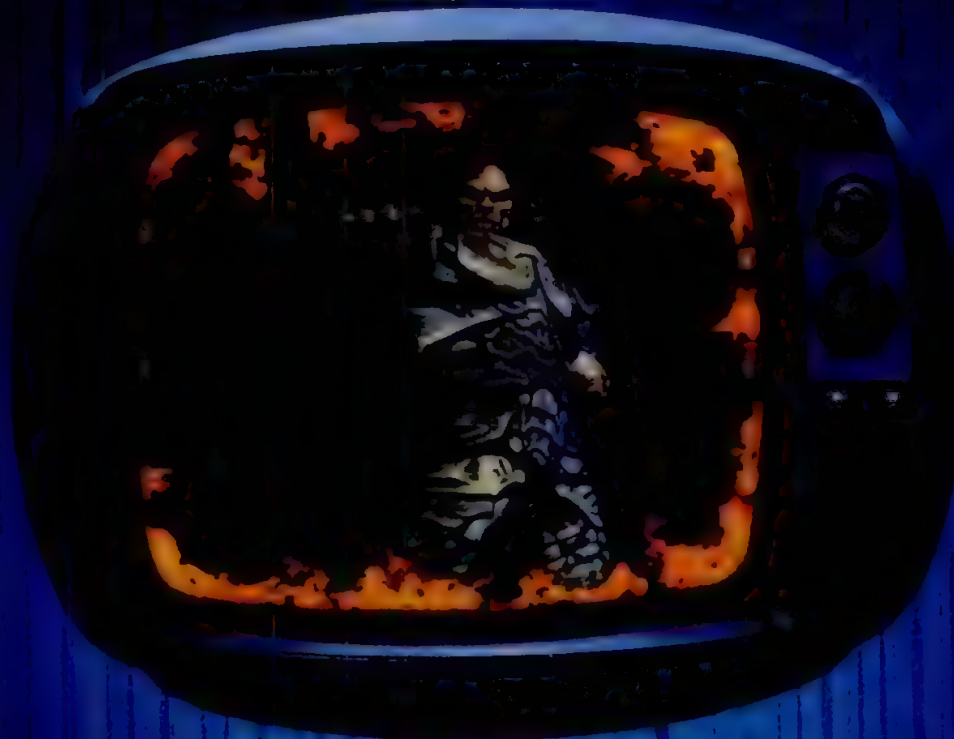
In Figure 3, I've written this formula at E2, but I've substituted a reference to D2 for the second argument (the criterion value). I've also made the references to the reject-code and occurrences ranges absolute, so that I could simply replicate E2's formula into E3:E11 to get the totals for the other reject codes.

SUMIF is the easiest way to tackle this problem. The next-easiest but most elegant way is to create a pivot table. Pivot tables are typically used for analyzing multidimensional data, but there's absolutely no reason you can't use them for simple tallies as well. To create the pivot table shown in Figure 4 from the worksheet shown in Figure 3, you would follow these steps:

- Select any cell in A1:B17.

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- Choose *PivotTable Report* from the *Data* menu.
- Accept the defaults in steps 1 and 2 of the PivotTable Wizard.
- In step 3, drag the *Reject Code* button to the Row axis and the *Number of Occurrences* button to the Data area.
- Click the *Finish* button.

One important thing to remember about pivot tables is that they are not refreshed automatically. To update your pivot table when your source data changes, select the table and choose *Refresh Data* from the *Data* menu. (Or click the red exclamation-point icon in the *PivotTable* toolbar.)

If you're working with an earlier version of Excel that supports neither pivot tables nor the SUMIF function, or if you're just in the mood to strain a little harder, you can accomplish the tally with an array formula. The array equivalent of the SUMIF formula above would be

```
=SUM((B2:B17="A")*
A2:A17)
```

As with all array formulas, you would press Shift-Ctrl-Enter after typing the formula.

The array formula first evaluates the proposition B2="A", returning either TRUE or FALSE. Then it multiplies the TRUE or FALSE result by A2. Next, it repeats the same steps with B3 and A3, and so on down to B17 and A17. Finally, it sums up the results of all these individual calculations. Since for calculation purposes, TRUE is equivalent to 1 and FALSE is equivalent to 0, the net effect is to add all the values in column A for which the corresponding cells in column B equal "A".

Finally, if you feel like working just a bit harder still, you can use the DSUM function. DSUM returns the totals of a particular database field, counting only those records that meet some criterion. The criterion itself has to be stated in a separate criterion range.

So, for example, to add up the occurrence values in rows where the reject code is A, you could create a criterion range that looks like this:

Reject code
A



If that criterion range were at, say, H1:H2, your DSUM formula would be

```
=DSUM(A1:B17,1,H1:H2)
```

What makes this technique awkward is the fact that each value you want to test for requires a separate criterion range. So to get

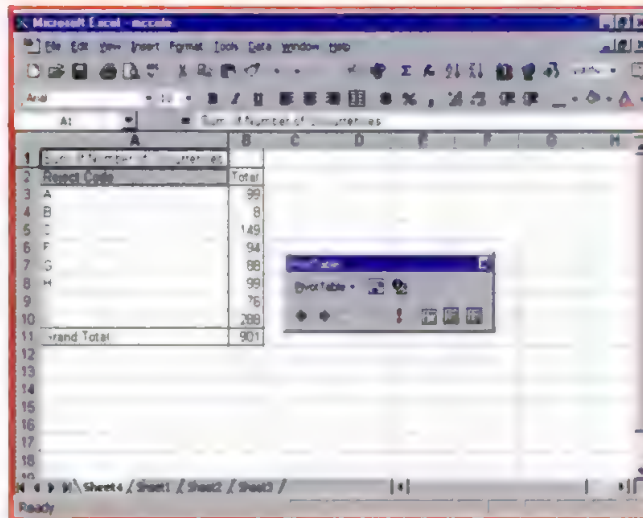


FIGURE 4: An alternative to the solution in Figure 3 is to create a pivot table that performs the tally, as shown here.

a complete table, you would need a criterion range for "A," another for "B," and so on. There's a way to automate that process with the help of the Data menu's Table command, but that method is so clumsy and opaque that it's not even worth discussion.

—Craig Stinson

Transposing Ranges The Easy Way

Now that I've explained how to transpose Microsoft Excel ranges the hard way, using the TRANSPOSE function (see "Transposing Excel Ranges" in the September 22, 1998, issue), I want to thank the many readers who wrote in to remind me of the easy way. Excel's *Paste Special* dialog box includes a handy *Transpose* check box. To transpose a range without having to resort to an array formula, follow these steps:

1. Select the range you want to transpose, and choose *Copy* from the *Edit* menu.
2. Select the upper-left cell of the range where

you want the transposition to appear.

3. Choose *Paste Special* from the *Edit* menu, and in the *Paste Special* dialog box, select the *Transpose* check box.

Voilà. Excel creates a transposed copy of your original range and updates all formulas appropriately.

Not only is this method easier to execute, it also has the advantage of letting you edit cells individually in the transposed copy. The only possible reason to use TRANSPOSE in preference to *Paste Special* is that the array produced by TRANSPOSE consumes less memory than the equivalent block of individual cells. Unless you're transposing a huge range or your system is seriously short of memory, you should probably forget that I ever mentioned TRANSPOSE! My apologies for the oversight.—Craig Stinson

Resetting an AutoNumber Field

After designing my Microsoft Access database, I deleted all of the test records. Now, I need to reset the counter field to 0. How do I do this easily in Office 95?

Dennis Tretiak
via the Internet

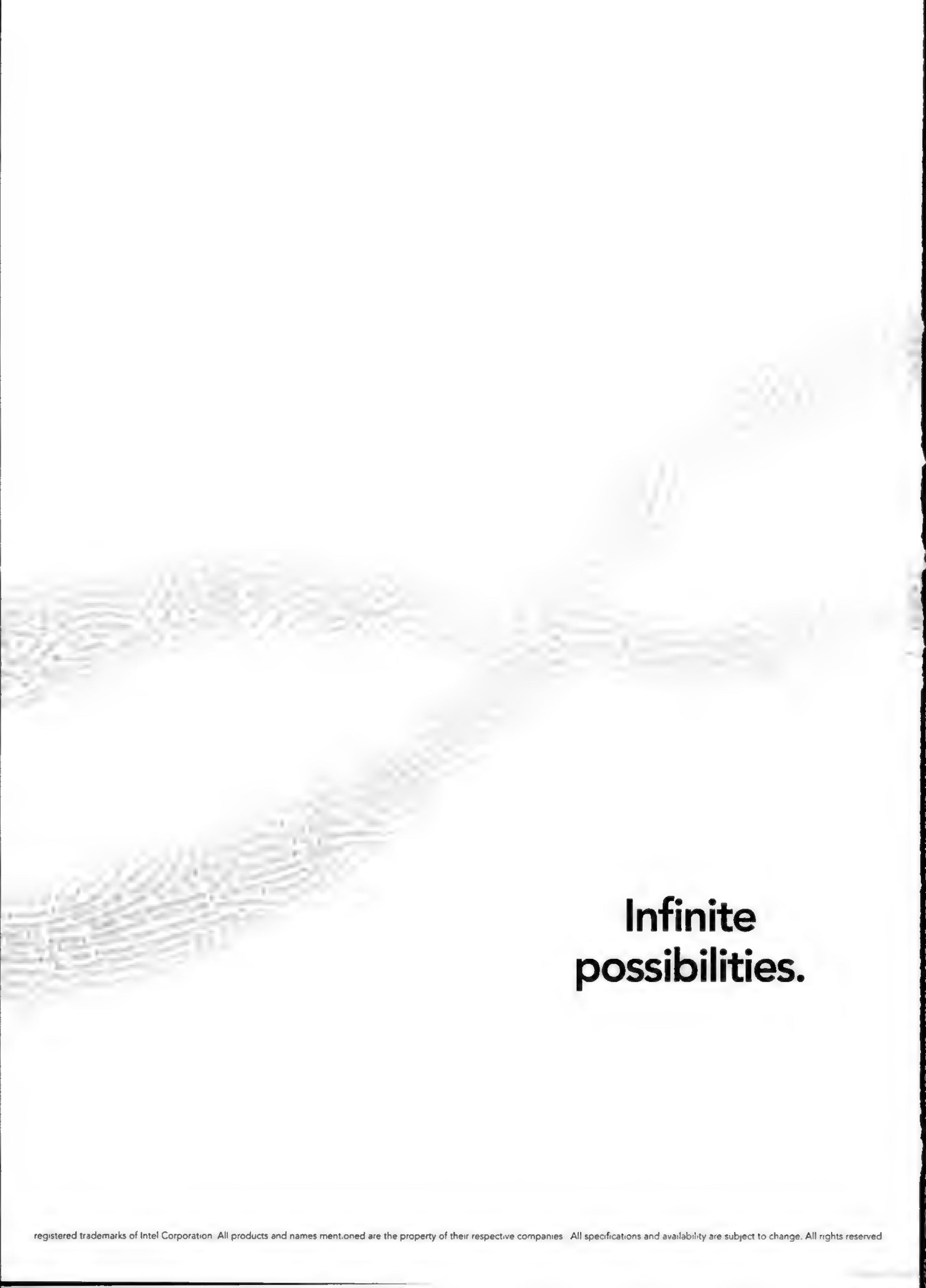
PC You have to compact the database after deleting all of your test records. First, back up your database. Then start Access, and if a database automatically opens, close it. Next, select the *Tools* menu, select *Database Utilities*, and then choose *Compact Database*. When the *Database to compact from* dialog appears, select your database and choose *Compact*. When the *Compact Database Into* dialog appears, type a name (a temporary name, make one up) in the *File name* text box and then choose *Save*. Access will then make a compacted copy of your database under the name you just entered. Bear in mind that you must have enough disk space for both your original database and this second copy.

When the compact operation completes, the dialogs will disappear and you'll have both your original database and the compacted copy on your hard disk. You'll have to delete your original database and then rename the compacted copy with the name of your original database.

Readers who want to change the starting value of an AutoNumber field in a table that isn't empty should refer to the procedure documented in the Microsoft Access help file.

—Sal Ricciardi **PC**





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Stay in Control when Installing Software

Every time you install a new program, the installation utility adds files to your system, replaces others, and changes registry and INI settings.

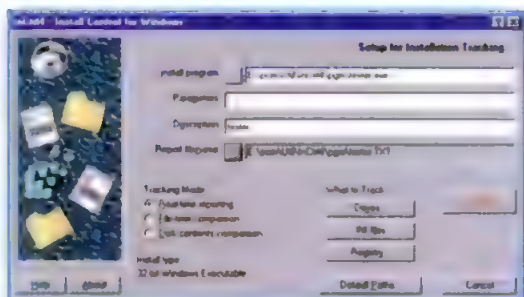
InCtrl4 can provide a record of exactly what changes the installation program made. The fourth major release of this popular utility, InCtrl4 adds a high speed, real-time reporting mode for Microsoft Windows 95 and Windows 98 that keeps track of changes to the file system and registry with-

out taking before-and-after snapshots.

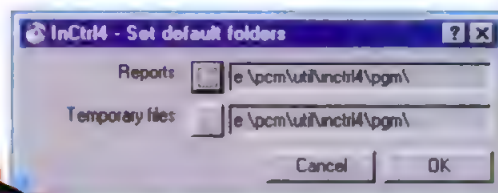
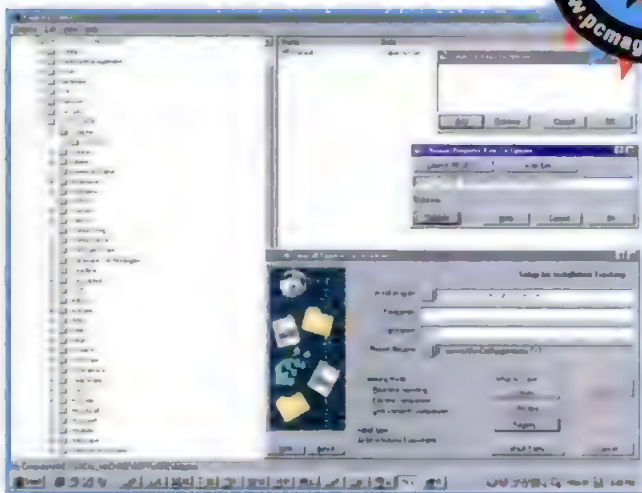
You can read about how to use InCtrl4 and how it was written on our Web site at www.pcmag.com/pctech/index-ut.html, where you can also download the utility and its source code.

Neil J. Rubenking, the primary author of InCtrl4, is contributing technical editor of PC Magazine. Rick Knoblauch, who wrote the VxD used for real-time reporting, is a systems programmer and frequent contributor. Sheryl Canter is editor of the Utilities column and a contributing editor of PC Magazine.

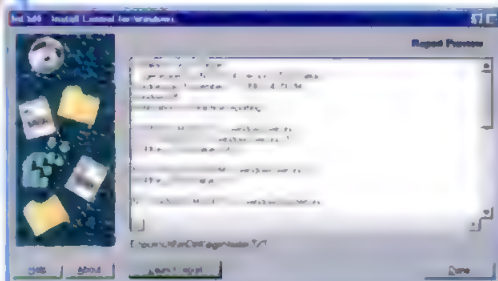
InCtrl4's main window lets you select an install program, a report file name, the tracking mode, and details of what to track.



InCtrl4 makes it easy to add registry keys that you want to exclude from monitoring. Use InCtrl4 to launch Regedit, highlight the key you want to ignore, and click InCtrl4's Grab Key button.



Click the main window's Default Paths button to set the default folder for InCtrl4's reports and temporary files. You can also change the report path and name on a project-by-project basis.



When you select the report filename, you can choose between plain-text or CSV (comma-separated value) output. After the install program finishes executing, InCtrl4 will display a preview of the report file.

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3802 233PII 32MB 4GB 13.3" AM 24X NT

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800 233PII 32MB 3.2GB 13.3" AM 24X

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800 266PII 32MB 4GB 13.3" AM 24X

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770X 300 PII 128MB 8.1GB 13.7" AM DVD

5327.16

770X 300 PII 128MB 8.1GB

13.7" AM DVD NT	5257.36
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NEC

Jameda 820 Palmtop PC 16MB

948.17

OmniBook 4600 266 NT 4GB 32MB

3527.28

OmniBook Soujourn 233 2.1GB 64MB

3814.24

FUJITSU

C340 233PII 32MB 3.2GB 12.1" DS 20X

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C350 266 PII 32MB 4GB 13" DS 20X

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E330 233 PII 32MB 3.2GB 12.1" AM 24X

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VB Pro 7755 266 PII 64MB

4GB 13.3" AM 24X NT	2989.00
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VB Pro 7775 300 PII 64MB 6 GB

13.3" AM 24X	3299.00
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32MB 4GB 12.1" AM 24X	1665.19
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Readwriter 15CT 266MMX

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Readwriter 15CX 266 MMX

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Catalyst 2924A 24-port 10/100 switch.....	1,109.27
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1602 56K Modular Router.....	1,307.77
1600 P/PXAT Feature Pack.....	153.96
2501 Ethernet Dual Serial Router.....	1,744.20
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400 PII 64MB 4 GB 10/100.....	2,118.41
Prosignia 740 servers	
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350 PII 64MB 4 GB 10/100.....	2,056.65
400 PII 64MB 10/100.....	1,998.64
400 PII 64MB 4 GB 10/100.....	2,398.50
450 PII 64MB 10/100.....	2,346.82
450 PII 64MB 4 GB 10/100.....	2,743.41

Prosignia 200 servers	
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SCSI 10/100 Ethernet.....	1,923.54
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450 PII 64MB 16X 10/100 Ethernet.....	3,162.85
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333 PII 64MB 10/100 Ethernet rack-mount.....	4,455.43
400 PII 128MB 10/100 Ethernet.....	2,829.36
450 PII 128MB 10/100 Ethernet.....	3,162.85
450 PII 128MB 10/100 Ethernet rack-mount.....	3,559.78
450 PII 256MB 10/100 Ethernet 3x4GB, array model.....	10,224.79

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HP DeskJet 722C color printer.....	299.00
HP DeskJet 1120Cse color printer.....	499.00
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4000CDD P2-233MHz 32MB/4 1GB HD 24X CD 56K Flex Card 12.1" SVGA TFT #54323 \$1,749

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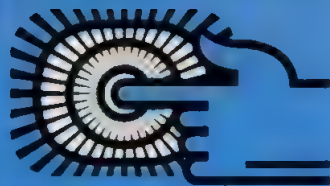
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DHTML That Works in Both IE and Navigator

By William Robert Stanek

Dynamic HTML debuted with great fanfare and lots of hype. It was promoted as one of the hottest technologies ever to hit the Web, and perhaps it is. You can use DHTML to create stunning Web sites chock-full of interactivity, animation, and special effects. You can also use DHTML to develop serious Web-based applications, multimedia presentations, and wonderfully detailed games. Unfortunately, more than a year after its introduction, DHTML hasn't really caught on. Of the millions of Web sites, only a relative handful use DHTML, and much of what's being done with the technology is fairly basic.

So what's keeping DHTML from taking off? The answer is simple: Microsoft Internet Explorer and Netscape Navigator support different versions of the technology,

and developers simply don't want to code everything twice. But we're here to tell you that it is possible to create DHTML pages that work in both IE and Navigator. You do this by exploiting the common ground between the IE 4.0 and Navigator 4.0 versions of DHTML.

Because of space limitations, we'll focus on the key issues rather than detailing each and every aspect of the two browsers' common ground. We'll look first at creating container elements and then at the essential cross-browser issues. For more information on DHTML, go to our Web site at www.pcmag.com/ptech.

CONTAINER ELEMENTS

At its core, DHTML is really a combination of three technologies: HTML, Cascading Style Sheets (CSS), and scripting. HTML is used to define Web page elements, such as paragraphs and tables. CSS is used to give style and positioning to elements. Scripting is used to interact with and update elements.

In an ideal world, you could use these technologies to manipulate any Web page element. However, because of differences in how IE and Navigator handle DHTML, you should always create a container to hold the elements you want to manipulate and then manipulate the container rather than the elements themselves. The element we recommend using for a container is `<DIV>`.

Why `<DIV>`, which is usually used to separate style areas for stylesheets? With `<DIV>` you have a single container that can be positioned and manipulated in both IE and Navigator. Thus rather than working with individual elements, such as paragraphs or

tables, you create `<DIV>` containers, add elements to them, and then manipulate the entire containers. Containers must be named in order to be accessed in cross-browser DHTML. So be sure to name the `<DIV>` container with the `ID` attribute, such as: `<DIV id="mycontainer">`.

You must also set the position of any container you want to manipulate in DHTML. You position containers in one of two ways: with absolute positioning or with relative positioning. With absolute positioning, you provide the exact location of the container. For example, you can specify that the container will be 25 pixels to the right of the main viewing area's left edge and 50 pixels down from the top of the main viewing area. With relative positioning, the container is positioned relative to where it is defined in

the Web page. For example, you could have the container follow the third element on the page and be indented 200 pixels.

You control the left/right position of the container (its *x*-coordinate) with the `left` attribute of CSS. You control the top/bottom position of the container (its *y*-coordinate) with the `top` attribute of CSS. In addition to being able to position elements on the *x*- and *y*-planes, you can also use the *z*-plane (think in three dimensions, in which you stack elements on top of each other). By giving a container a higher *z*-index, you

can place it in front of another element.

The *z*-index of normal page elements is 0. Valid *z*-index ranges for IE include positive and negative integers. However, Navigator *z*-indexes must be 0 or a positive integer. Because of this, your cross-browser pages should use only *z*-indexes of 0 or greater.

Figure 1 shows how you can assign *x*, *y*, *z*-coordinates to two containers. The first container is positioned with absolute coordinates 50 pixels to the right of the main viewing area's left edge and 100 pixels down from the top of the main viewing area. The second container is positioned with relative coordinates 50 pixels to the right of the main viewing area's left edge. Both containers



FIGURE 2: Figure 1 produces this arrangement, with the absolutely positioned container covering the image and the relatively positioned one following it.

```
<html>
<head>
<style type="text/css">
<!--
#abs { position: absolute; top:
100px; left: 50px; z-index: 2;
height: 50px; width: 150px}
#rel { position: relative; left:
50px; z-index: 2; height: 50px;
width: 150px }
-->
</style>
</head>
<body>

<div id="abs">
<p>Absolute positioning
example!</p>
</div>
<div id="rel">
<p>Relative positioning
example!</p>
</div>
</body>
</html>
```

FIGURE 1: This page demonstrates relative versus absolute positioning of containers.

have a *z*-index of 2, which places them in front of normal elements on the page. Because the first container is absolutely positioned, it appears over the image in Figure 2, while the relatively positioned container appears after the image.

REFERENCING OBJECTS

Now that you know how to create and position containers for IE and Navigator, you're ready to tackle the syntax differences for referencing containers in scripts. As you would expect, IE and Navigator reference containers in two different ways.

IE4 supports a *document object model* for rendering and manipulating dynamic Web pages. In this model, each Web page element is represented by an object, which can be controlled with scripting. The easiest way to access an object is to use the name assigned in the ID attribute. In order to access the `<div id="abs">` container created in Figure 1, you would use the `abs` object.

Once you correlate an object ID to an object name in IE, you can control the object's position, highlighting, and other characteristics using the associated `style` object. All dynamic changes to an object are handled with scripting techniques. You move the `abs` container by setting new values for its top and left positions. You change the characteristics of the `abs` container by setting new style assignments. For example, you could change the left position of the `abs` container using the `style` object `abs.style.left`, as follows:

```
abs.style.left += 5;
```

Rather than supporting a document object model, Navigator 4 supports an *object tree*, where elements are accessed according to their positions in the tree. The key to accessing specific element layers is the ability to traverse the tree structure. The root of the tree is the document object. The next level of the tree is accessed via the `layers` object or by the name assigned to the ID attribute. Child layers are always accessed via their parent layers. If you create the following containers

```
<div id="layer1">
<div id="a"> <p>Layer 1-A</p></div>
<div id="b"> <p>Layer 1-B</p></div>
</div>
```

you could set the left attribute of layer 1 with either of the following statements:

```
document.layers['layer1'].left += 5;
document.layer1.left += 5;
```

To set the left position of layer A, you would do this via layer 1 as in any of the following:

```
document.layers['layer1'].document
.layers['a'].left += 5;
document.layer1.document.a.left += 5;
document.layers['layer1'].document.a.
left += 5;
```

```
<html>
<head>
<script>
function test() {
  if(document.layers) {
    document.moving.left -=3;
    if (document.moving.left < 0) { document.moving.left
= 640; }
  } else if (document.all) {
    moving.style.left = parseInt(moving.style.left) - 3;
    if (parseInt(moving.style.left) < 0 ) {
moving.style.left = 640; } }
  setTimeout('test()',200);
}
</script>
</head>
<body onload="test()">
<div id="moving" style="position: absolute; top: 100px;
left: 50px; z-index: 2; height: 50px; width: 150px ">
<h1>Moving text is cool!</h1>
</div>
</body>
</html>
```

Figure 3. This code shows how to animate text in a way compatible with both IE and Navigator.

As you can see, having to traverse the object tree for multiple layers is a chore. If you avoid nesting containers and position each container independently, you can avoid traversing multiple levels of the tree.

Because IE and Navigator reference object attributes in different ways, you'll need conditional statements in your code to determine which syntax to use based on which browser is viewing your pages. One way to check for browser type is to use `navigator.appName` to detect the browser name and `navigator.appVersion` to detect the browser version. However, a more robust solution is to check for supported objects. Only Navigator 4.0 or later supports the `document.layers` object. Only IE 4.0 or later supports the `document.all` object. Because of this, you can use conditional

statements to check for the presence of these objects and thus determine which syntax to use when.

Figure 3 shows an example of how you could do simple text animation with `object.style.left` and `document.object.left`. If `document.layers` is detected, the Navigator syntax is used. If `document.all` is detected, the IE syntax is used. There are other key attributes of `object.style` and `document.object` you'll want to manipulate: `bgcolor` sets the background color, `background` sets the background image, `clip` sets the clipping rectangle, `top` sets the vertical position, `visibility` displays or hides the container, and `zIndex` positions the container in front of or behind other elements.

In Figure 3, you should note several other DHTML techniques, such as the technique used to obtain the current position of the container. Even though Navigator is able to extract values directly, IE can extract positional values only via the `parseInt()` function. Note also that the `onload` event is used to trigger the `test()` function *after* the page has finished loading. Elements in a Web page don't exist until they have been parsed, which is why you must use `onload` or a similar event that ensures the browser has parsed the element you want to work with before attempting to manipulate it.

To perform more advanced manipulation of elements, you'll want to use object references. Here, you create a reference to the object called `MyMove` that is then used in the actual function:

```
<!--
function getReady() {
  if(document.layers) { MyMove =
document.moving;
  } else if (document.all) { MyMove =
moving.style; }
  test()
}
function test() {
  MyMove.left =
parseInt(MyMove.left) - 3;
  if (parseInt(MyMove.left) < 0 ) {
MyMove.left = 640 }
  setTimeout('test()',200);
}
-->
```

Then change the line `<body onload=`

"test()") in Figure 3 to <body onload="getReady()".

This technique creates cleaner code and allows you to reference the appropriate object from any function in your page without having to use conditionals over and over. As you can see, in the new function, all positional values are parsed. This ensures that the function works properly in both IE and Navigator.

MORE CROSS-BROWSER TRICKS

After taking a look at Figure 3, you may wonder why we've included the style settings within the <div> tags. The reason for this is that IE can't read some properties (such as clip, left, and top) from JavaScript. To avoid having to use in-line styles and creating a lengthy Web page, you can set the left and top values directly in JavaScript with pixelLeft and pixelTop respectively. An advanced workaround is to have IE manipulate the stylesheet rules object rather than the object itself. But you'll need to be an experienced scripter to try this technique.

Internet Explorer isn't the only browser to have a few known problems with DHTML. A known bug for Navigator 4.0 causes elements to lose their dynamic settings when



the browser window is resized. To get around this problem, you should reload the page anytime the Navigator window is resized, as follows:

```
if (document.layers) {
  window.onResize = reloadNow; }
function reloadNow() {
  document.location =
  document.location;
}
```

Changing content on the fly is another technique you'll want to master. In IE, you change the content of a container using innerHTML. In Navigator, you change content by opening the document stream with document.open(), writing the new content with document.write() or document.writeln(), and then closing the document stream with document.close(). Using these IE and Navigator features, you could change the text of a container with the ID moving as follows:

```
if(document.layers) {
  document.moving.document.open();
  document.moving.document.write("
<h1>Hello!</h1>");
  document.moving.document.close();
} else if (document.all) {
  moving.innerHTML=
  "<h1>Hello!</h1>";}
```

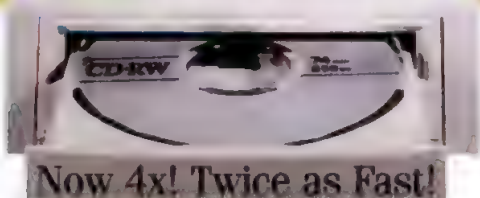
While we're on the subject of resizing the browser window, you can work with the main browser window in other ways as well, by using the screen object. If you want to size the main window based on the characteristics of the user's monitor, you can use screen.height and screen.width. The first checks the height of the screen, and, predictably screen.width checks the width of the screen. To check the screen's color depth, use screen.colorDepth. Both Internet Explorer and Navigator use these properties.

Well, that's all we have room for here. We hope you learned some cool new techniques that you can use in your DHTML pages. **PC**

William Robert Stanek is the creator of CentralDrive.Com and WebLearningCenter.Com, online communities for the wired world. He can be contacted at netdesigns@tvpress.com.



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PC TECH

The Most Powerful C++ For Windows Yet?

By Richard V. Dragan

All the excitement surrounding the Java programming language might give you the idea that C++ should be placed at the head of the endangered species list. But whatever the future may hold, C++ is still arguably the best way to get top performance and access to cutting-edge features on today's Microsoft Windows platforms, including Windows 98 and Internet Explorer 4.0. Microsoft certainly thinks so. The new release of Microsoft Visual C++ 6.0 Enterprise Edition (\$1,299 list) illustrates why C++ is likely to continue playing a strong role in today's Internet and database applications for the enterprise. This package offers a compelling array of new features that make it an absolutely essential upgrade for existing Visual C++ 5.0 users. It also offers unprecedented ease-of-use features for those just starting out with C++ and the Microsoft Foundation Classes (MFC), as well as significant improvements for enterprise development.

GETTING STARTED: BETTER WIZARDS

The strength of Visual C++ has traditionally been in its wizards and its MFC library. The new version makes tapping the power of MFC easier than ever. AppWizard is the Visual C++ tool many developers use to start building C++ projects. With AppWizard, you create an application's basic working skeleton, which you can then customize during the development cycle. The newest version lets you target a broader range of projects. For example, you can build applications that use Active Document Containers, or that omit the document/view architecture. Also, your applications can "contain" other Active Document components (such as those from Microsoft Office 97 applications). Under the hood, a new MFC

class, `COLEClientItem`, manages the details of Active Document containment.

The new AppWizard also makes it a snap to write a browser-based application that can use the functionality of Internet Explorer 4 to display Web content. Additionally, Dynamic HTML can now be stored in project resource files along with other Windows resources, such as bitmaps, icons, and cursors, so you can deliver browser-based apps that carry their own hypertext within their executables. (The new MFC `CHtmlView` class makes this browser-style type of application possible by encapsulating the functionality of Internet Explorer.) AppWizard lets you use resizable, dockable

MFC, adding up to hundreds of methods and functions. Visual C++ 6 goes a long way toward alleviating these difficulties. Borrowed from Office 97, its IntelliSense technology will probably be the most appreciated feature for any working C++ programmer. Here's why: As you finish typing the name of a C++ object, the IntelliSense wizard brings up a list of all methods for that object, along with overloaded versions of the same function and all parameters. (IntelliSense lists all methods, declarations, identifiers, and even comments in context as you work.)

We found this feature extremely useful; you don't even have to type to select a method. It's also context-sensitive (only the methods associated with each object appear in the pop-up list of methods) and extensible (so that the same feature works with your own code). The IntelliSense wizard will also display help text associated with a method so other programmers on your team can get help on custom methods. Additionally, you can see relevant parameters in pop-up windows when you hold the cursor over any object or method without typing.

IntelliSense marks a real leap forward over other RAD tools, though Sybase's Optima++ and Inprise Corp.'s C++Builder have had some form of on-the-fly parameter wizardry for years. For experienced developers, the tool doesn't get in the way. And for those who are new to MFC, IntelliSense offers invaluable help.

Another obstacle faced in gaining control of C++ was the lack of a good class browser. Previous versions of the ClassView browser were less than ideal: You usually had to re-compile a project in order to update your view of classes, methods, or members. Now ClassView is enhanced in significant ways. First, the

ClassView panel updates as you type, thanks to dynamic parsing. And ClassView is more powerful in that it can manage the creation of IDL statements behind the scenes for working with Component Object Model (COM) objects. This is a lot more effective when working with COM at a low level, especially with Active Template Library (ATL) components (which cannot use MFC's ClassWizard tool).

Other environment improvements include better warnings for common program-

toolbars (called *ReBars*) automatically for any AppWizard-generated application.

EASE OF USE

Though AppWizard provides an excellent starting place for building applications, the difficulty of the C++ language is a hurdle for beginning and intermediate programmers. Besides the complex language features in C++ itself, programming for Windows means becoming familiar with the Windows API and





PC TECH

ming errors and an enhanced macro facility for instant recording and playback of commonly used keystrokes.

Several new C++ keywords help high-end developers create faster programs. The `_forceinline` keyword can force the compiler to inline a function, and the `_assume` keyword defines expressions that will not change, enabling the compiler to make optimizations based on that assumption. Also for high-end programmers, the compiler now supports use of overloaded new operators with corresponding delete operators. (As with earlier versions, the new operator can be overloaded, but now the correct version of delete is called in case of allocation errors.) These higher-end compiler enhancements accompany a commitment to ANSI/ISO C++, including all Standard Library C++ classes.

Visual C++ 6 showed a modest performance improvement over Version 5 on our benchmark tests.

TESTING

All this razzle-dazzle is fine, but what about basic compiler performance? The Visual C++ 6.0 compiler itself offers speed and size enhancements. We tested the product using a subset of PC Magazine Labs' compiler tests, comparing the new Visual C++ 6 with Version 5. Visual C++ 6 showed a modest performance increase (about 2.2 percent) over Visual C++ 5 on several computation-intensive, synthetic benchmark tests. (Significantly, the new Visual C++ offers new optimizations for Pentium Pro CPUs too.)

We also timed debug builds, which have been optimized in this new version, but we were unable to demonstrate faster build times. For partial debug builds, however, in which a single change is made to the source code and the application is rebuilt, we saw build times reduced by about 28 percent (well in line with the vendor's claim of 30 percent faster build times). Basically, this improvement results from optimized precompiled header files. A further benefit of the new version is smaller executables: The same Visual C++ 5 test program recompiled in Visual C++ 6 resulted in a 17 percent smaller EXE file.

DEBUGGING IMPROVEMENTS

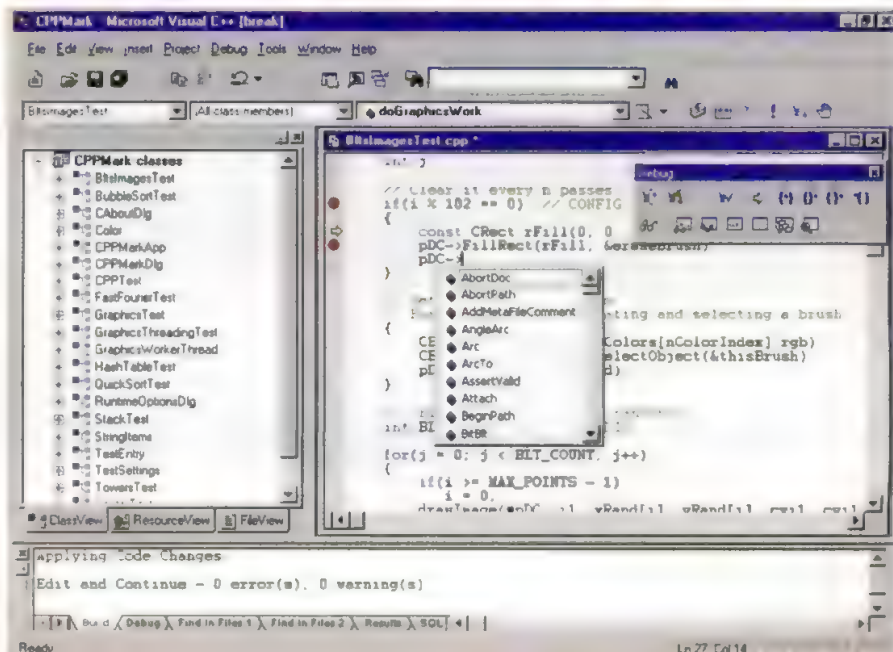
When it comes to debugging, Visual C++ 6 offers some real enhancements, most notably the *Edit and Continue* feature. With this ad-

vance, the traditional edit-compile-link-debug cycle is dismantled. Now C++ programmers, like Visual Basic developers, can update a running executable during a debug session. We found this an extremely useful enhancement, and one that makes C++ development much quicker. But we also discovered that larger changes to code would prevent *Edit and Continue* from working. In such cases, the program must be stopped, rebuilt, and then restarted. In general, however, this technology marks a big step forward.

For higher-end developers, several other new features will also improve the testing and debugging process. First, the product now supports multiple monitors, so you can build in one screen and debug in another, making it much easier to spot and solve problems with interface design. Visual C++ 6 is also more intelligent about loading DLLs; it

can now show you which DLLs are loaded during a debugging session in its *module view* window. (Thus, for example, you can see which DLL causes a program to crash.) You can now mark and defer the loading of DLLs until they are needed at runtime—another advance for those concerned with tweaking the performance of large applications. (Windows applications, unless they manage the details of loading and resolving dynamic link libraries programmatically, have always loaded all their DLLs when they start up.)

Low-level debugging in Visual C++ 6.0 also gets a boost, with new access to MMX registers available on Pentium MMX CPUs. You can now use MASM-format hex numbers (such as "4321h") in all debugger expressions, which means it's a lot easier to modify a register's contents using your assembly language expertise. The debugger is also savvier when displaying pointers (and v-pointers inside classes). Instead of hard-to-read hex addresses, the debugger will attempt to use the names of methods. One of the difficulties with MFC programming is that accessing error codes obtained through calls to `GetLastError()` is inconvenient. Visual C++ 6.0 makes this a lot easier, by displaying the contents of `GetLastError()` as a pseudoregister named `ERR` so developers can always see the last error on a given thread inside their applications. Another new feature in MFC is the `AfxCheckError()` function, which lets you check the results of



Visual C++ 6's new programming environment stresses ease of use with its IntelliSense auto-completion technology, which lets you program with MFC, ATL, or custom methods without typing all the code yourself.



ActiveX/OLE operations programmatically.

Programmers can also view the contents of variant data types more easily. Depending on the type of data a variant contains—such as string (BSTR) or numeric data types—the contents are now correctly displayed and labeled without the digging that past versions required. You can now view GUIDs and related types using the names given by the system registry (if available)—a further boon to ActiveX programmers. Features like these will certainly help put ActiveX/OLE programming into the hands of more programmers.

INTERFACE IMPROVEMENTS

One of the traditional benefits of Microsoft's C++ to program Windows is that it puts the latest and greatest user interface controls into your hands. The tradition continues in Version 6.0, with new MFC classes that expose new components from Windows 98 and Internet Explorer 4.0. Classes such as `CDateTimeCtrl` (for the new date/time picker), `CMonthCalCtrl` (for the new calendar control), and `CPropertySheetEx` (for Windows 98-style property sheets) ensure access to the newest user interface enhancements. New MFC classes also beef up support for Internet programming. Besides new classes such as `CHtmlView` for creating IE4-style browser-based applications and `CIPAddressCtrl` for editing IP addresses, old MFC classes have been improved. `CHttpServer`, for example, now supports writing data to a server, and `CInternetSession` has improved support for programming with cookies. About two dozen MFC classes have been revised, and many favorite UI controls such as combo boxes, progress bars, and image lists have new visual enhancements.

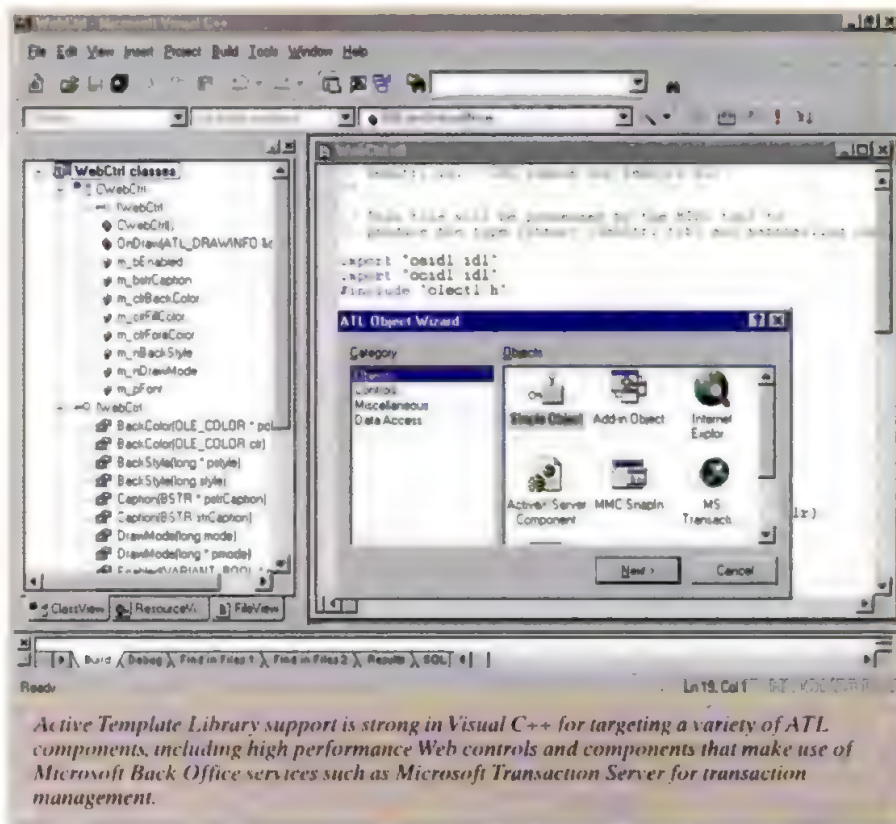
WINDOWS DNA SUPPORT

Like the other tools in the Visual Studio lineup, Visual C++ 6 offers excellent integration with Microsoft Back Office's server-side components, including Microsoft SQL Server 6.5 (included with the Developer Edition), Microsoft Transaction Server for transaction management, and Microsoft Message Queue Server for reliable queued message delivery. Collectively, these and other server-side technologies are known as the Windows Distributed interNet Application (DNA) architecture. All of these objects are exposed through COM/DCOM objects, and because Visual C++ offers excellent support for programming with COM, the product is ready for building applications that use the latest and greatest in Microsoft technologies. For higher-end organizations, its clustering wizard enables you to develop code that can scale efficiently across

hardware platforms with multiple CPUs. You can also target Microsoft Management Console (MMC) snap-ins. (MMC is a central feature for managing the back office in the Windows NT 4 option pack and will be standard for all system administration in the next version of Windows NT.) Developers can write to the MMC specification for code that will work with the management console today.

First, AppWizard provides extensive support for ATL controls, which can be DLLs, EXEs, or even Windows NT services. You then add to these components particular ATL objects, which can be Web controls (both full and light versions) or Internet Explorer controls. You can also add database capabilities and even take advantage of new Microsoft Back Office applications such as Microsoft Transaction Server.

The upgraded ClassView tool gives you full control over members, methods, message handlers, and connection points automatically. In previous versions of Visual C++, the main difficulty in programming with ATL was that the



NEW ATL SUPPORT

Even if you don't plan to use these DNA technologies right away, components are the secret to reusable code. The foundation of component building in Visual C++ is ActiveX technology, which in turn relies on COM. Visual C++ is the tool of choice for creating the smallest, most efficient components using the ActiveX Template Library (ATL). It supports building several types of ATL components, from standard components for Web-based applications to server-side ATL components and even composite controls (which combine other components). ATL programming has never been easy, but Version 6 puts ATL development into the hands of the majority of C++ programmers for the first time.

MFC ClassWizard tool was not available (because ATL controls do not rely on traditional MFC control functionality). In testing the new version, we found that programming with ATL bypasses the ClassWizard tool used for MFC so effectively that we didn't miss the older tool. ATL programming requires working very closely with COM. But the ClassView tool automates writing the IDL interfaces and C++ prototypes for building ATL components.

With the new range of ATL functionality, including the soup-to-nuts catalog of Web controls and Microsoft Back Office technologies, programmers will be turning to ATL to do more and more. Instead of using it just for lightweight Web controls—the original pur-



pose of ATL 1.0 a few years back—developers are looking to it as a general purpose component strategy for programming in Windows.

DATABASE FEATURES

Whatever your organization's focus, chances are that databases are an important part of your daily programming life. Visual C++ 6.0 offers ways to access various types of databases and technologies. Microsoft's latest standard is OLE DB, and Visual C++ 6.0's template code gets you started writing OLE DB providers with a lot less effort. A new form class in MFC called `COleDBRecordView` makes it possible to view OLE DB database records inside MFC applications.

The *Database Explorer* tab in Visual C++ continues to be a strong feature of the product, and with new support for Oracle 8, more developers will be able to use the product for database development and administration. Besides extensive support for viewing and modeling SQL Server 6.5 databases, you can build queries visually and write and debug stored procedures. An invaluable feature is SQL debugging support. In testing, we had no trouble writing and stepping through SQL statements using the Visual C++ environment. The program also supports SQL syntax highlighting. The diagramming option makes it possible to document a database design, and better yet, the design document can be used to create and manage the underlying database tables and views, including joins and triggers where appropriate.

ENTERPRISE FEATURES

Sharing a design is one thing, but Visual C++ 6 (and Visual Studio) in the Enterprise Edition offers an Object Repository for sharing components with anyone in your organization. Once an object is placed in the repository, it can be reused across an organization. The Object Repository is another way to take advantage of the power of COM-based components, and facilitates *n*-tier development of components.

Visual C++ developers are

used to the ClassView object browser; the new Enterprise Edition offers Microsoft Visual Modeler, a full-fledged component modeler, which incorporates design tool expertise from the well-known CASE tool vendor Rational Rose Software. As with other modeling tools,

Modeler lets you design a class hierarchy and add operations and attributes; the tool then generates the skeleton C++ code. With this capability, the product is well integrated into the process of software engineering: You can design and document a class hierarchy and code it separately. In testing, we appreciated the ability to import all MFC classes into the tool. A handy class wizard makes it easy to add new classes, and classes can be imported and exported to and from Microsoft Object Repository.

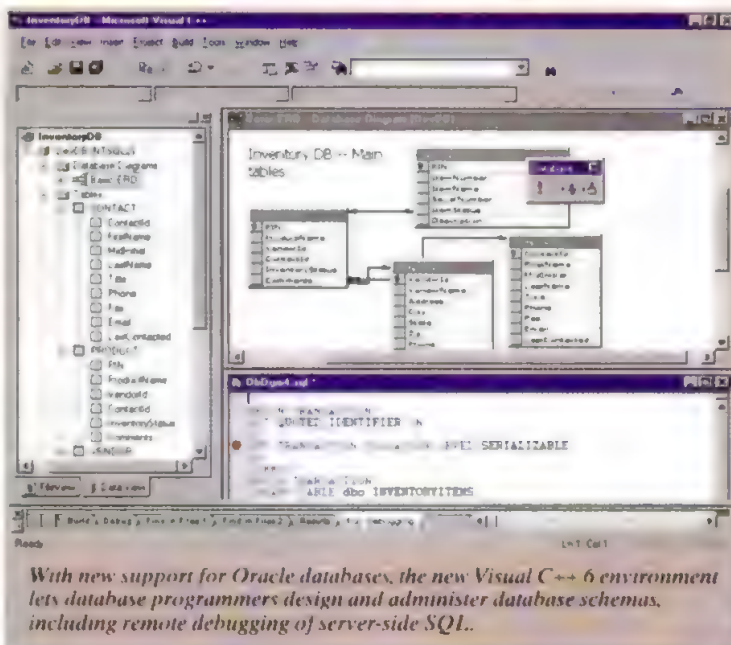
Another powerful tool available in the Enterprise Edition is Visual Studio Analyzer, which lets you visualize—and profile—all the COM-based components running on a particular machine. As complexity increases in today's *n*-tiered systems, especially with back-end processes such as Microsoft Transaction Server and other servers working together to provide reliable transactions, debugging can quickly become very difficult. The Analyzer tool puts real-time debugging of complex components in distributed systems into the hands of ordinary mortals.

IN SUM

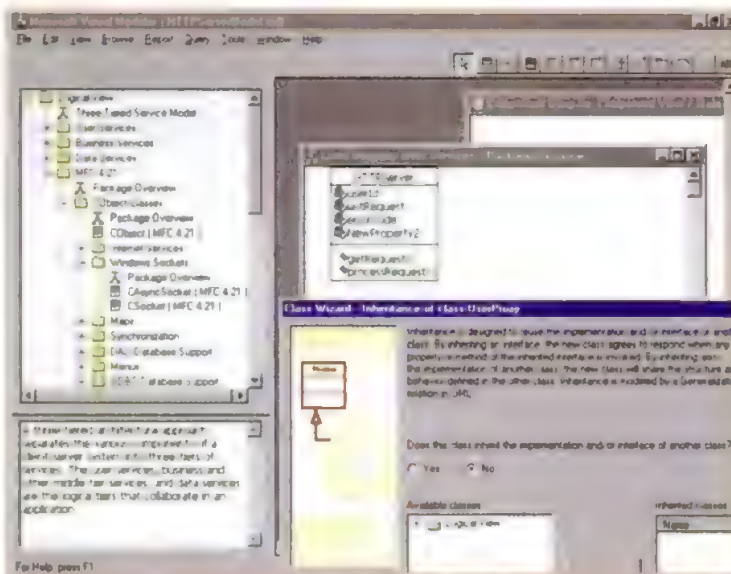
With its combination of leading-edge ease-of-use features and high-end enhancements for the enterprise, Visual C++ 6 will be a necessary upgrade for existing users. It moves the state of the art in C++ compilers and tools up a notch, and it puts the language into the reach of more programmers and organizations. As long as there is a Windows operating system, tools such as Visual C++6 will help deliver the fastest code and the greatest access to cutting-edge Windows features. Thus the role of C++ in the enterprise is not likely to diminish in the foreseeable future.

Microsoft Visual C++ 6.0 Enterprise Edition. \$1,299 list (\$759 upgrade). Microsoft Corp., Redmond, WA; 800-426-9400; msdn.microsoft.com/visualc. **PC**

Richard V. Dragan is a programmer at PC Magazine Labs and a frequent contributor.



With new support for Oracle databases, the new Visual C++ 6 environment lets database programmers design and administer database schemas, including remote debugging of server-side SQL.



Microsoft Visual C++ 6.0 Enterprise Edition includes the Visual Modeling tool, which is integrated with MFC classes for designing and documenting classes and creating other documents required in the analysis and design process.

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CP9090: IBM PC300GL PII/350MHz, 32MB, 3.2GB, Win 98, DT	\$1049.00
CP9094: IBM PC300PL PII/350MHz, 32MB, 3.2GB, Win 98, DT	\$1329.00
CP9096: IBM PC300PL PII/450MHz, 64MB, 6.4GB, 32X, Win NT, MT	\$1899.00
CP8985: HP Brio 7133, Celeron/300MHz, 32MB, 2.1GB, 32X, MT, Win 98	\$829.00
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PR12864: HP DeskJet 722C 8ppm b/w/4ppm color NEW!	\$299.95
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PR14305: Xerox DocuPrint P12 12ppm/600dpi/optional network	\$699.95
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#37260	4010CDT	266 PII MMX	32	4.1 GB	24X	12.1" TFT	56K	'2,049
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#36607	628513U	333 Celeron	32MB	3.2GB	—	W98	'899
#36590	627557U	350 PII	32MB	3.2GB	—	W98	'1,049
#36612	627575U	450 PII	64MB	6.4GB	32X	NT	'1,649
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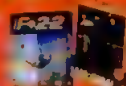


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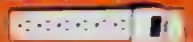
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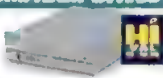
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59713 333PII/32MB/5.1GB/24X	\$929
104483 300Celeron/32MB/4.3GB/32X/56K/Win98/15" Monitor/30-bt Scanner/Leamark Printer	***99*
106963 350PII/32MB/6.4GB/32X/Win98	\$999
102317 400PII/32MB/8.4GB/32X/10/100	\$1299

*After 120 mt. rebate



Compaq Desktop 6000	
45968 233PII/32MB/2.1GB/24X/10/100/WinNT	\$799
Compaq Deskpro EP & EP SBS Towerable Desktop	
102353 300Celeron/32MB/4.3GB	\$849
102355 333Celeron/32MB/4.3GB	\$899
102356 333Celeron/64MB/6.4GB/32X	\$1149
102357 350PII/64MB/4.3GB	\$1129
102358 350PII/64MB/10.0GB/32X	\$1449
102359 400PII/64MB/10.0GB/32X	\$1549
102360 450PII/64MB/10.0GB/32X	\$1679
Compaq EN Desktop	
102341 300Celeron/32MB/3.2GB	\$1029
102285 333Celeron/32MB/3.2GB/10/100	\$1149
102344 333Celeron/32MB/3.2GB/32X	\$1079
102291 350PII/64MB/10.0GB/10/100/WinNT	\$1599
59838 350PII/32MB/6.4GB	\$1259
102347 400PII/32MB/6.4GB	\$1369
102294 450PII/64MB/10.0GB/10/100/WinNT	\$1949
102348 450PII/64MB/9.1GB/32X/WinNT	\$2399
Compaq EN Miniktower	
102343 300Celeron/32MB/3.2GB/32X	\$1149
102346 333Celeron/32MB/6.4GB/32X	\$1299
102288 333Celeron/32MB/6.4GB/32X/10/100	\$1379
102296 450PII/64MB/6.4GB/32X/10/100/WinNT	\$1869
59851 350PII/64MB/6.4GB/32X/WinNT	\$1549



Hewlett-Packard Brio	
102177 333Celeron/32MB/4.3GB/32X	\$899
101971 350PII/32MB/8.0GB/32X	\$1199
104051 400PII/64MB/8.0GB/32X	\$1599
102670 450PII/64MB/8.0GB/32X	\$1749
Hewlett-Packard Vectra VES	
103656 350PII/32MB/3.2GB	\$1079
103835 400PII/32MB/3.2GB	\$1359
104041 400PII/64MB/6.4GB/32X	\$1589
103841 450PII/64MB/6.4GB/32X/10/100	\$1999
Hewlett-Packard Vectra VLS	
100959 350PII/64MB/4.3GB	\$1329
100966 350PII/64MB/4.3GB/32X	\$1499
100968 400PII/64MB/6.4GB/32X	\$1799
58873 400PII/64MB/10.1GB/32X/10/100	\$1829
103132 400PII/64MB/10.1GB/32X/10/100	\$2099
104768 450PII/64MB/10.1GB/DVD/10/100	\$2179



IBM PC 300 GL Desktop	
59503 350PII/64MB/3.2GB	\$1319
59582 400PII/64MB/3.2GB	\$1589
IBM PC 300 GL Miniktower	
59580 333PII/32MB/3.2GB	\$1068
59584 350PII/64MB/6.4GB/32X	\$1559
59585 400PII/64MB/6.4GB/32X	\$1699
IBM PC 300PL Desktop	
54681 350PII/64MB/6.4GB	\$1759
54682 400PII/64MB/6.4GB	\$1879
IBM PC 300PL Miniktower	
54686 350PII/64MB/4.2GB	\$1699
54687 400PII/64MB/6.4GB	\$1899

Inteva Miniktower

105610 333K6-2/32MB/3.2GB	\$599
104915 333M1/32MB/4.0GB/24X/56K/Win98	\$699
104571 333PII/32MB/4.0GB/Win98	\$799
104916 333pxm/32MB/3.2GB/24X/56K/Win98	\$799*
104573 333PII/32MB/4.0GB/32X/Win98	\$899
104559 350K6-2/64MB/6.4GB/32X/56K/Win98	\$999
104564 333PII/64MB/6.4GB/32X/56K/Win98	\$999
104566 350PII/64MB/8.4GB/32X/56K/Win98	\$1099
104567 400PII/64MB/8.4GB/32X/56K/Win98	\$1299

*Includes 15" monitor

UMAX

UMAX PC Miniktower	
105100 350PII/64MB/6.4GB/36X/56K/8MBAGP	\$999
105101 400PII/64MB/8.4GB/36X/56K/8MBAGP	\$1299

NOTEBOOKS



Acer Extensa	
105816 266MMX/32MB/3.2GB/20X/56K/12.1"DS	\$1279
103764 266MMX/32MB/4.1GB/20X/56K/12.1"TF	\$1599
57896 233PII/32MB/4.1GB/24X/56K/13.3"TF	\$2149



Compaq Armada 1700 Series	
103055 233PII/32MB/3.2GB/24X/56K/12.1"HP	\$1999
58995 233PII/32MB/4.0GB/24X/56K/12.1"TF	\$2299
103054 300PII/32MB/5.0GB/24X/56K/14.1"TF	\$3499
Compaq Armada 3500 Series	
103057 266PII/32MB/4.1GB/12.1"TF	\$2699
103058 300PII/64MB/6.4GB/13.3"TF	\$3599
Compaq Armada 7000 Series	
102985 300PII/64MB/6.4GB/24X/13.3"TF	\$3895
102989 300PII/64MB/6.4GB/24X/33.6GB/13.3"TF	\$4955
55276 266PII/64MB/5.0GB/20X/13.3"TF	\$3599
102995 300PII/64MB/8.0GB/DVD/33.6GB/14.1"TF	\$7999
Compaq Presario	
102462 266AMD-K6/32MB/4GB/24X/56K/12.1"HP	\$1699*
102463 266MMX/64MB/4.0GB/24X/56K/12.1"TF	\$1999*
102464 300PII/64MB/6.4GB/24X/56K/12.1"TF	\$2399*
58296 266PII/64MB/4.0GB/24X/56K/13.3"TF	\$2799
101785 300PII/64MB/6.4GB/DVD/56K/13.3"TF	\$3499*

*After mtb. rebate



Fujitsu LifeBook	
102864 266PII/32MB/4.0GB/20X/56K/13.3"HP	\$1599
102055 233PII/32MB/3.2GB/24X/56K/12.1"TF	\$1799
102854 233PII/32MB/3.2GB/24X/56K/13.3"TF	\$2199
102859 266PII/32MB/4.0GB/24X/56K/13.3"TF	\$2599
104626 266PII/32MB/4.0GB/56K/13.3"TF	\$2699
104625 266PII/32MB/4.0GB/20X/56K/13.3"TF	\$2899
102061 300PII/32MB/5.0GB/24X/56K/13.3"TF	\$2899



Hitachi VisionBook	
58878 233PII/32MB/3.2GB/24X/56K/12.1"TF	\$2199
102035 266PII/32MB/4GB/24X/56K/12.1"TF	\$2399
100119 266PII/64MB/4GB/24X/56K/13.3"TF	\$2799
102033 300PII/64MB/6.4GB/24X/56K/14.1"TF	\$3999



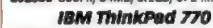
IBM ThinkPad 380	
101585 233PII/32MB/4GB/24X/13.3"TF	\$2158
103306 233PII/32MB/4GB/13.3"TF	\$2278
101586 300PII/32MB/4GB/24X/13.3"TF	\$2598
IBM ThinkPad 390	
104279 233MMX/32MB/3.2GB/56K/12.1"TF	\$1099
104280 233PII/32MB/3.2GB/56K/12.1"TF	\$1899
104283 266PII/64MB/4.3GB/56K/14.1"TF	\$2799



IBM ThinkPad 560	
47383 233MMX/32MB/4.0GB/12.1"TF	\$1599
101593 233PII/32MB/4GB/56K/12.1"TF	\$2458
101594 300PII/64MB/6.4GB/56K/12.1"TF	\$3258
101595 300PII/64MB/6.4GB/56K/12.1"TF	\$3398



IBM ThinkPad 600	
100860 233PII/32MB/3.2GB/24X/56K/12.1"TF	\$2729
54590 266PII/32MB/4GB/24X/56K/13.3"TF	\$3399
101589 300PII/64MB/5.1GB/24X/56K/13.3"TF	\$3599
101590 300PII/64MB/5.1GB/OPE	\$4059



IBM ThinkPad 770	
101581 300PII/128MB/8.1GB/56K/14.1"TF	\$4999
54597 266PII/64MB/8.1GB/56K/14.1"TF	\$4498
101583 300PII/64MB/8.1GB/56K/DVD/14.1"TF	\$4658
101582 300PII/128MB/8.1GB/24X/56K/WinNT/14.1	\$4998



Sharp Actius UltraLite	
59797 233MMX/64MB/3.2GB/56K/11.3"TF/3lbs	\$1999
103002 266MMX/64MB/4.3GB/56K/11.3"TF/3lbs	\$2299

TOSHIBA

Toshiba Satellite	
101103 233PII/32MB/4.1GB/24X/56K/2.1"DS	\$1499
101104 233PII/32MB/4.1GB/24X/56K/12.1"TF	\$1899
103394 266PII/32MB/4.1GB/24X/56K/12.1"DS	\$1599
103398 266PII/32MB/4.1GB/24X/56K/12.1"TF	\$1899
103446 300PII/64MB/6.4GB/24X/56K/13.3"TF	\$2799
Toshiba Portégé	
101101 266PII/32MB/4.3GB/56K/12.1"TF	\$2798
102877 300PII/32MB/4.3GB/56K/12.1"TF	\$3398
Toshiba Tecra	
101320 233PII/64MB/6.4GB/24X/56K/12.1"TF	\$2398
101323 266PII/64MB/6.4GB/24X/56K/13.3"TF	\$2949
102883 300PII/64MB/6.4GB/24X/56K/13.3"TF	\$3345
102882 300PII/64MB/8.1GB/24X/56K/14.1"TF	\$3815

HANDHELD PCS

JCom	
39153 PalmPilot Professional Edition 1MB	\$229.95
54104 Palm III 2MB, Backlit, Infrared Port	\$49.95
Beepwear	
51083 Pager Watch (Ridge Face)	\$99
57121 Pager Watch (Five Point Face)	\$99
Casio	
104992 Casiopea E-11	\$395
Compaq	
50627 C-Series 2015c	\$999
Cross	
52245 CrossPad After 950 rebate	\$349.95
102534 CrossPad XP 6" x 9"	\$99
Franklin Electronics	
101561 REX Pro 5 for Laptops	\$189.95
101562 REX Pro 5-DS for Desktops	\$299.95
Hewlett-Packard	
49958 820 Jornada Handheld PC	\$419
49958 620UX Color Palmtop PC	\$699
50973 660UX Color Palmtop PC	\$899
Philips	
55577 Nino 301 4MB w/Dock and Battery	\$299.95*
58903 Nino 312 8MB w/Dock, Batt., Modern Coupon	\$399.95*
51843 Velo 500 16MB w/Dock	\$499.95*
51844 Velo 500 24MB w/Dock	\$599.95*
*w/rebate.	
Psion	
42202 Series 5 Palmtop 8MB	\$449.95
Sharp	
48466 Mobilon HC-4500	\$649.95
51817 Mobilon HC-4600 16MB	\$699.95
104295 Mobilon Pro 5000	\$899
104289 In-Pad PV-6000	\$999

MONITORS

Daewoo Electronics	
101646 15" 518K	\$119
103044 17" 7108	\$199
EZC International	
48292 15" EZ-V15000	\$159
49253 17" EZ-P17000	\$249
Hitachi	
43320 19" Elite 751	\$699
39084 21" SuperScan Pro 800	\$899
IBM	
55514 16" Rat Panel LCD TFT (White)	\$1799
55520 16" Rat Panel LCD TFT (Black)	\$1799
Iiyama	
102655 17" VisionMaster 400	\$449
49635 19" VisionMaster 450	\$599
55681 21" VisionMaster 501	\$899
KDS USA	
101895 14" VS-4D	\$129
10575 15" VS-55	\$149
46332 17" VS-7	\$239
MAG Technology	
38304 15" D130	\$189
38260 17" D1700	\$309
32695 17" DX700T Technitron	\$329
Mitsubishi	
100825 NEW! 19" Diamond Scan 90E	\$689
100804 17" Diamond Plus 72	\$499
53318 17" Diamond Plus 100E	\$1099
101099 21" Diamond Pro 1000E	\$1299
NEC	
43812 15" MultiSync A500	\$229

43816 15" MultiSync E500	\$289
100198 17" MultiSync M700	\$579
49696 17" P750 Mist White	\$689
55433 20.1" LCD2010 (LCD+)	\$999
104182 21" MultiSync E1100*	\$1129
101425 21" MultiSync P1250 (Trinitron)	\$1149



Philips	
100838 17" 107S	\$299
Princeton Graphics	
45278 17" Ultra 72	\$249
101420 19" E0900	\$499



Sharp	
52908 15" High-Resolution LCD TFT	\$1499



Sony	
48123 15" Multiscan 100ES	\$229
48752 15" Multiscan 100GS	\$289
48755 17" Multiscan 200ES	\$399
48756 17" Multiscan 200GS	\$499
48748 17" Multiscan 200PS	\$679
48749 19" Multiscan 400PS	\$839
48758 21" Multiscan 500PS	\$1249



39386	15" Optquest Q53	179
39387	17" Optquest Q71	259
100217	17" Optquest V73	359
48644	17" E771	349
49867	17" GS771	379
31254	21" G810	999
31252	21" P810	1099
102762	21" P815	1279
39127	21" P813 SonicTron	1169



183672	NEW! Phaser 780 Color Laser Printer	4900
Xerox		
194005	DocuPrint C55 Color Laser	\$1799*
50445	DocuPrint N24 Laser	2399
194056	DocuPrint C55MP Color Laser	2299*
48239	DocuPrint N32 Laser	2799
50441	DocuPrint N40 Laser	3400

*Special pricing while supplies last.

SCANNERS

Fujitsu		
52843	ScanPartner 600C SCSI Flatbed w/ADF	\$1300
Hewlett-Packard		
181191	ScanJet 4100 Cse	\$190
48649	ScanJet 5100 Cse	299
181853	ScanJet 6200 Cse	390

IBM		
184080	IdeaScan	129*
184056	Flatbed Color	149.95*

*After mfr's rebate.

Memorex		
54036	SCF 6120P Flatbed	99.95
54037	SCF 9360P 3D Flatbed	79.95

Microtek		
104196	ScanMaster C3 USB	\$49.95*
57799	ScanMaster X6EL	229.95*
101546	ScanMaster 4	690

Minolta		
46812	Dimage Scan Dual Film Scanner	5690

Nikon		
56077	Super CoolScan 2000	\$1790

Polaroid		
31234	SprintScan 35 Plus	\$1399

UMAX		
101863	Astra 1220U	\$129*
54475	Astra 1220S Cross-Platform	149*
40085	Astra 1200S	149*
51167	PowerLook II Duo/Photoshop LE	899*

VisiOneer		
102589	PaperPort One-Touch 5300	500
182590	PaperPort 6100CE	119*
40455	PaperPort Strobe Pro	149.99*
53944	PaperPort OneTouch Flatbed	100*

*After mfr's mail-in rebate.

DIGITAL CAMERAS

Canon		
57727	PowerShot A5 Digital Camera	\$400
57435	ZR MiniDV Camcorder	995
101874	Vistara MiniDV Camcorder	1495
57434	Optura MiniDV Digital Camcorder	1795

Kodak		
56897	DC220	\$679
56896	DC260	899

Nikon		
104285	Coolpix 900s	\$749
56074	Coolpix 600	379

Olympus		
55672	D-340L	\$400
104248	D-400 Zoom	799
47234	D-600L	899
104249	D-620L	1199

SONY		
103305	NEW! Mavica FDB1	\$790
105337	NEW! Mavica FDB1	999
59952	Mavica FDB1	499
59953	Mavica FDT1	699

Toshiba		
100907	PDR-M1	\$495

PROJECTORS

EPSON		
53877	PowerLite 5000MB LCD Projector	\$4000

InFocus		
101433	LP425 LCD Projector	\$4199
101445	LP735 LCD Projector	6899

Polaroid		
52858	Polaview 211E LCD Projector	\$3499
49917	Polaview 215 LCD Projector	3199

INPUT DEVICES

Adesso		
106778	Eagle Touch Keyboard PS/2, Win98	\$12.95
54451	Powermouse Ergonomic PS/2	14.95
30217	Nu-Form Split-Key Keyboard PC	29.95
30219	Nu-Form Split-Key Keyboard w/TouchPad PC	44.95

21348	TriForm Extended Keyboard PC	44.95
Belkin		
104477	WebRacer Internet Controller	\$50.95
58906	USB 3 Button Mouse	19.95
58884	USB 104 Key Keyboard	39.95
48333	USB Express Hub	100.95

Cross Pen		
52344	iPen Pro	\$134.95

Good Systems Inc.		
181526	TelevsiorT3 Pro PC TV Converter	\$329.95
35455	Optical Laser PS/2 Mouse	29.95

Kensington Technology Group		
25095	Expert Mouse	\$99.95
57985	Mouse in a Box Scroll PC	24.95
30635	Orbit Trackball PC	48.95

Keytronic Corporation		
39390	104 Keyboard PS2	\$24.95
40987	Keytronic Classic Keyboard	29.95
57899	Lifetime Mouse PS/2	39.95

Logitech Inc.		
182661	Cordless Desktop Keyboard and Mouse	\$90.95
48729	Trackman Marble FX	79.95
48727	Trackman Marble Plus	59.95
102961	MouseMan Wheel Mouse	49.95
48943	First Mouse PS/2	16.95

Marlow Data Systems		
32781	105 Keyboard	\$29.95
21457	2-Button Ergonomic Serial Mouse	14.95
21458	2-Button Trackball	24.95

Wacom		
181872	Intuos 618	\$289.95

MULTIMEDIA

Creative Labs		
100196	Sound Blaster LIVE	\$195.95
190142	Sound Blaster 128 plus 4-Pc. Speakers	149.95
53742	Blaster 32X CD-ROM Drive	69.95
103447	PC-DVD Encore 5X DVD-ROM NR	249.95
45080	PC-DVD Encore Dxr2	199.95*
53366	3D Blaster Voodoo2 12MB PCI	189.95*

*After mfr's mail-in rebate.

DATA STORAGE

Hewlett Packard		
100153	SureStore 8110L CD-Whirlie Plus External	\$399
101297	CD-R Media 50-Pack	89.95
105040	8GB Colorado Internal Tape Drive w/Tape	259
195042	8GB Colorado External Tape Drive w/Tape	299
195043	24GB SureStore Det 24i DDS-3 Internal	1099

Imaging		
102641	Zip Drive Parallel External	\$119.95
102640	Zip Drive SCSI External	119.95
40889	Zip Drive SCSI Internal w/Zip Zoom	119.95
40890	Zip Drive ADAPL Insider	99.95
44785	Zip Plus	169.95
103833	Zip Disk 10-Pack (Gray)	99.95
106383	Zip Drive 1GB SCSI External (Refurbished)	199.95
22616	Zip 1GB SCSI External	299.95
102878	Zip 2GB SCSI External	349.95
24282	Zip 1GB Disk Single	99.95
32556	Zip 1GB Disk 3-Pack	269.95
47679	Zip 2GB Disk 3-Pack	299.95

Kodak		
181840	CD-R Media 30	\$59.95

Memorex		
52488	CD-R 74min 10-Pack w/SCD Mail-in Rebate	\$27.95
39020	CD-R 74min 100-Pack	149.95
48599	CD-RW Disc 5-Pack w/5 FREE CD-R Discs	49.95

Meridian Data		
102404	8GB Snap! Server	\$949.95
102405	16GB Snap! Server	1699.95

Quantum		
49043	DLT IV 35/70GB Tape Cartridge	\$84.95
58541	5.1GB Fireball EL Ultra DMA HD	159
59089	4.3GB Fireball SE Ultra SCSI HD	299
59088	6.4GB Fireball SE Ultra SCSI HD	369
59087	4.3GB Fireball SE Ultra SCSI HD	489

Seagate		
49529	2.1GB Medalist IDE HD	\$115
46199	3.2GB Medalist IDE HD	119
51478	4.3GB Medalist Ultra ATA HD	139
51475	6.5GB Medalist Ultra ATA HD	169
58294	8GB TapeStor Int. SCSI Travan Tape Drive	219
54435	9.1GB Medalist Pro Ultra ATA HD	239
54431	9.1GB Barracuda 9LP SCSI	539
55083	9.1GB Cheetah Ultra2 LVD HD	719
55519	18.2GB Barracuda Ultra Wide SCSI HD	999
56524	4.5GB Cheetah Ultra2/LVD HD	1299

Smart and Friendly		
53407	4x12 CD Speedwriter SCSI Internal	\$340
53408	4x12 CD Speedwriter SCSI External	429.95
50101	4x24x6 CD-RW 426 SCSI External	599

Western Digital		
48919	6.4GB Caviar Retail-Packaged HD	\$149.95*
55997	8.4GB Caviar Retail-Packaged HD	179.95*
101327	10.1GB Caviar Retail-Packaged HD	229.95*
106455	13.0GB Caviar Retail-Packaged HD	279.95*

*After mfr's mail-in rebate.

Yamaha		
102843	4x12x6 CRW4116S Internal SCSI	\$419.95
102844	4x12x6 CRW4116S External SCSI	5499

UPS & POWER

American Power Conversion		
18559	Back-UPS 280 (180 Watts)	\$59.95
56170	Back-UPS Pro 650 (410W)	279.95
56167	Back-UPS 500 (330W)	149.95
21929	Back-UPS Pro 1000 (670W)	389.95
56164	Back-UPS 300 (180W)	99.95
56165	Back-UPS Extra 280	84.95
56169	Back-UPS Pro 420 (260W)	229.95
31466	Smart-UPS 700 Net (450W)	369.95
31468	Smart-UPS 1400 Net (950W)	639.95
31470	Smart-UPS 2200 Net (1600W)/PowerChute	999.95

Opti-ups		
181381	280ES (280W)	\$99
181383	420ES (420W)	149

Tripp Lite		
181180	Super 6 + Tel	\$350.95
21831	Super 7 Surge Suppressor	17.95
6786	Isobar 4 Ultra	44.95
8630	Isobar 6 Ultra	54.95
13147	Isobar 6 Ultra	64.95
25274	BC Internet 325 VA (After mfr's \$25 rebate)	44.95
21844	BC Pro 1400 UPS (940 Watts)	419.95
45091	SmartPro 1400 NET UPS	494.95

Networking		
53994	3Com/USR External faxmodem	\$149.95
55204	Fast Ethernet XL with Wake Up 5-pack	389.95
51639	SuperStack II Dual Speed Hub 500 24-Port	949
53751	SuperStack II Switch 3300 24-Port	2309

Asante Technology		
38297	10BaseT FriendlyNet 8-Port Hub	\$54.95
100083	FriendlyNet 10/100 8-Port Switch	379.95

Bay Networks		
100960	Baysstack 450 switch 24-Port	\$2299

Belkin		
37711	OmniView KVM 2-Port	\$189.95
32966	OmniView KVM 8-Port	279.95

Cisco		
52927	Catalyst 2924XL 24-Port Switch	\$900

DLink		
53371	Dual Speed 10/100BTX SOHO 4-Port Hub	\$84.95
53384	Dual Speed 10/100BTX 8-Port Hub	219.95
53385	Dual Speed 10/100BTX Stackable 8-Port Hub	299.95
53373	DPE-916X 10/100BTX 16-Port Hub	599.95

HP Networking		
29582	Jat Direct EX Plus Print Server Ethernet (A/E)	\$229.95

Intel		
45634	PRO/100+ PCI Adapter 5-pack	\$339.95
103647	Create & Share Camera w/Software & Burny Disk	109.95*
104535	Netport Express 3-Port Print Server	299.95*

Linksys		
58287	10/100BaseTX PCMCIA PC Card; 16-bit	\$74.95
58282	10/100BaseTX PCMCIA PC Card; 32-bit	79.95
58283	10/100BaseTX Ethernet 5-Port Hub	69.95
59650	10/100BaseTX 24-Port Auto-sensing Hub	429.95
59629	10/100BaseTX PCI Ethernet LAN Card	29.95
58288	10/100BaseTX 8-Port Auto-Sensing Hub	149.95

Netgear		
35444	RX10TX 10/100BaseTX Fast Ethernet PCI Adapt.	\$28.95
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53568	DS108 10/100BaseTX 8-Port Hub	219.95
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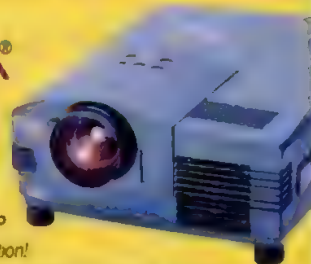
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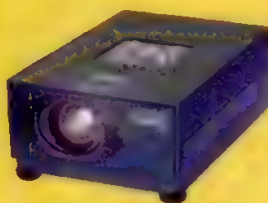
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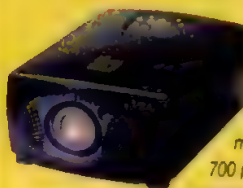
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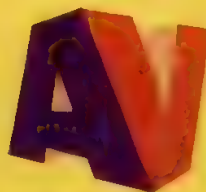
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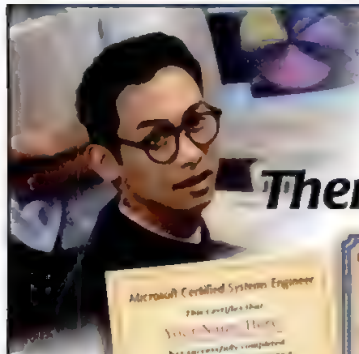
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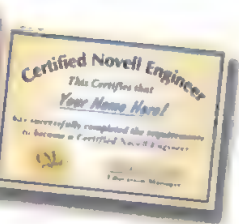
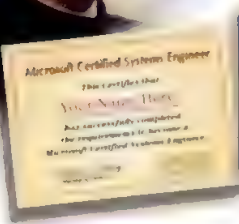
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Hint #2:
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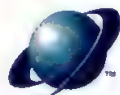
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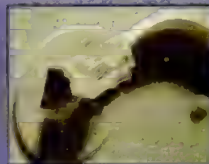
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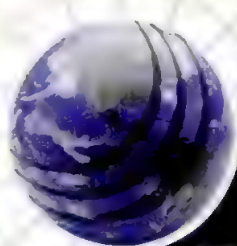
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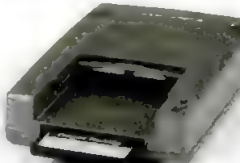
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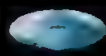
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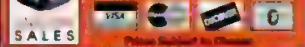
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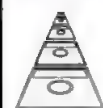
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Encarta 99, Grolier, and World Book are also available as components of three-CD reference suites. With the exception of Encarta 99, these provide minimal integration of the added resources. The Encarta suite, which you can also purchase on DVD, neatly ties the encyclopedia together with the 1999 versions of Microsoft Bookshelf and Virtual Globe. Also of note is the 1999 World Book Family

Reference Suite, which incorporates IBM's ViaVoice Gold speech-recognition technology to enable easier navigation through the program.

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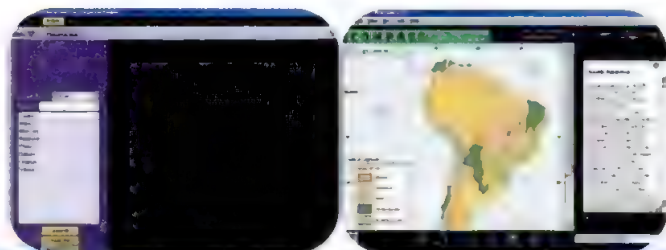
without voice-over narration.

Compton's text base is aimed at the same junior-high/high-school audience as Encarta 99, Grolier, and World Book. In readability, it ranks above Grolier and somewhat below the other two.

Its multimedia assets, however, are well short of Encarta 99's and World Book's. Most of what the program calls movies are actually either animations or narrated slide shows, and the MIDI-based musical clips are a

Britannica, for example, you can read Freud on psychoanalysis, Russell on relativity, and Shaw on socialism. The CDs also offer time lines covering nine subjects and easy access to economic,

disk swapping. With its article outlines appearing alongside the full text, its button-bar access to special features, and its natural-language search capability, *Britannica* gets high

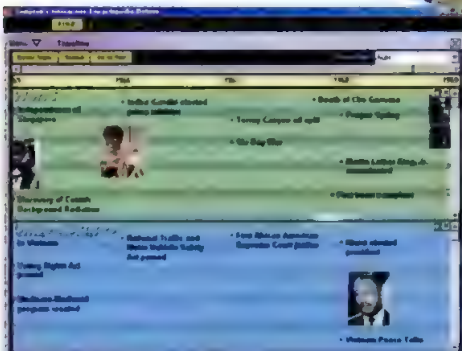


Microsoft Encarta Encyclopedia Deluxe 99



Microsoft grabbed the golden ring with this year's version of the Encarta encyclopedia. In terms of usability, multimedia drama, and sheer wealth of information, Microsoft Encarta Encyclopedia Deluxe 99 is not only a vast improvement over Encarta 98,

In terms of usability and wealth of information, Encarta 99 stands well ahead of the competition.



COMPTON'S ENCYCLOPEDIA 1999 DELUXE
★★★★★ \$39.95 list. Mindscape Inc.,
800-622-3399, www.mindscape.com.

poor substitute for human performances.

Though it doesn't rank with the top players, Compton's offers some distinctive features for school-age kids.

Encyclopædia Britannica CD 99

The two-disk CD version of the venerable *Britannica* has taken steps toward becoming a multimedia encyclopedia, but its strength remains the imposing text database. With 44 million words in all (some articles stretch to a textbook-length 100,000 words), Encyclopædia Britannica CD 99, Multimedia Edition, has no competition for depth. The program's multimedia aspects have always been a bit thin, but they are definitely improved.

The CD version, moreover, besides duplicating the text of the print version, offers both timely updates and classics from earlier days. From the 1926 print



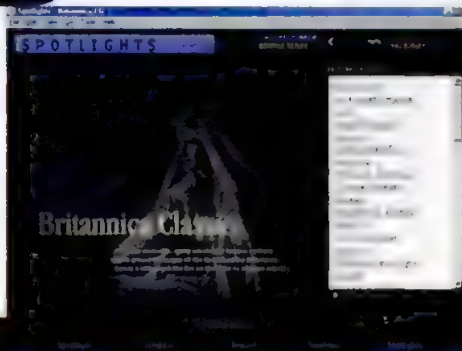
MICROSOFT ENCARTA ENCYCLOPEDIA DELUXE 99
★★★★★ \$79 street. Microsoft Corp.,
800-426-9400, www.microsoft.com.

political, and social data concerning 191 nations or world regions. This information is especially handy for comparative purposes: You can view Japan's economic patterns compared with those of the United States, for example.

New this year are 1,600 articles, 450 photos and illustrations, and 15,000 Internet links. *Britannica* has also touched up its interface and provided a setup option that eliminates

usability marks. Nevertheless, it is without the exceptional inviting quality of both Encarta 99 and World Book.

If *Britannica* has a shortcoming, it is the lack of multimedia. The CDs have plenty of photos, maps, and diagrams but only a few movies and animations. If you can live without these entertainments, *Britannica* is an unparalleled information bargain.



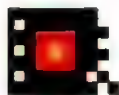
ENCYCLOPEDIA BRITANNICA CD 99
★★★★★ \$119 list. Encyclopædia Britannica Inc.,
800-747-8513, www.eb.com.

but it also stands well ahead of its competitors in this rather closely contested market.

Microsoft acquired Collier's multimedia encyclopedia this year and has folded about 3,500 of Collier's articles into Encarta 99's text base. Because Collier's had targeted a slightly older readership than Compton's, Encarta 99, or Grolier, the acquisition should bolster Encarta 99's appeal to high-school and college students. Microsoft also added some 4,500 new articles of its own for Encarta 99 to boost its total to approximately 40,000.

More important, Microsoft has increased the encyclopedia's sidebar count from 1,000 to 2,000. Sidebars present contemporaneous accounts of and source documents related to historical articles and events. They're an invaluable resource unique to Encarta 99.

In addition to the enhancements to the program's content, Encarta 99 gets a very welcome face-lift. Leading the makeover is an article contents page, which



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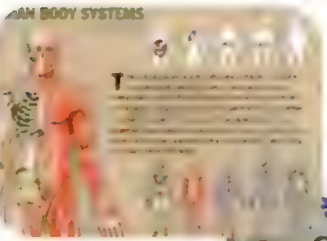
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presents at a glance all the elements related to a chosen topic. It's an incredibly comprehensive page, including a navigable outline of the article text, single-click access to multimedia elements, and lists of available sidebars, related articles, related yearbook updates, and relevant Web resources. Article text itself now appears in a clean, double-spaced layout that matches 1999 World Book Deluxe Edition's layout for on-screen readability.

Other improvements this year



include a natural-language search capability, a Quick Facts section that provides handy overviews of topics such as the states and the presidents, and a new Homework Center. Along with last year's Research Organizer, Encarta 99 now includes an extensive term-paper tutorial and some valuable new lesson plans for teachers and home-schooling parents.

For an additional \$30, you can purchase the Encarta Reference Suite 99—five CDs including Encarta Virtual Globe 99 and Microsoft Bookshelf 99, along with Encarta 99. You can also get the whole thing—plus 70 percent more videos and full-screen video playback—on a single DVD.

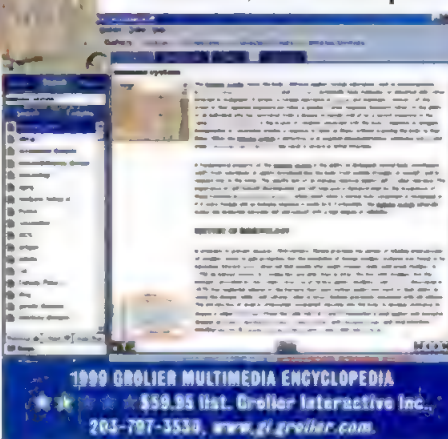
1999 Grolier Multimedia Encyclopedia

The best aspect of the 1999 Grolier Multimedia Encyclopedia, Deluxe Edition, is that it serves such a broad range of users—from elementary school to college students. That's because, in addition to its own

double-CD encyclopedia geared toward middle- and high-school students, Grolier offers access to two Internet-based resources: The New Book of Knowledge (for young kids) and Encyclopedia Americana (for college-age researchers).

Though most of the major articles on the CDs provide one-click access to these online texts, if you need exhaustive detail, you won't find the online Americana as satisfying as Britannica. But if you chiefly want high-school-level resources and only occasionally need more than the typical encyclopedia fare, the Grolier package may serve you well.

In keeping with its school orientation, the Grolier pack-



age includes an Activities and Study Guide booklet—handy for homeschooling parents as well as classroom teachers. There are also some new curriculum-oriented Guided Tours. Those who register get a set of *The New York Times* Science Questions and Answers.

Although this year's edition features a slightly improved user interface, Grolier is still far less visually inviting than Microsoft's Encarta 99 or IBM's World Book. Most distracting is the program's small type and close spacing, which do little to encourage browsing or on-screen reading. Moreover, though the program's 100 new panoramic views (detailing places from African game reserves to Antarctic icebergs) and ocean-floor maps are wel-

come additions, its multimedia offerings in general remain a disappointment.

For an extra \$30, Grolier offers a Multimedia Reference Suite, which adds Bartlett's Familiar Quotations Expanded Multimedia Version 2, the Ham-



mond Atlas of the World, and The Wall Street Journal Almanac on three additional CDs.

1999 World Book Deluxe Edition

More than any other CD encyclopedia, IBM's 1999 World Book Deluxe Edition appears to have been designed from the ground up with students and teachers in mind. The encyclopedia presents well-edited articles in a screen-friendly format that encourages browsing and reading.

Its major articles come with bibliographies (organized by reading level) and suggested study questions. Where appropriate, a Webliner button takes users to an Internet site that offers research and curriculum support. A set of Homework Wizards help learners assemble text and media into polished reports. The 1999 edition of World Book adds two new components to the Homework Wizards. A Quiz Wizard helps students create flash cards and quizzes for exam preparation, and a Web Page Wizard provides templates that enable classrooms, families, or individ-

ual users to create newsletter-style Web pages.

World Book also boasts an outstanding set of media resources, including many long videos of exceptional quality, virtual-reality tours, animations, simulations, and 360-degree panoramic views. Unfortunately, browsing these assets requires nearly constant disk swapping, because the browser lives on disk 1, while most of the goods dwell on disk 2.

New in this year's World Book is a Cyber Safari—an extensive multimedia tour of the



San Diego Zoo. If you're into animals, this is a major attraction. If you're not, you may wonder why IBM chose to invest so much in a single multimedia item.

For about \$30 extra, IBM offers World Book Family Reference Suite. On three CDs, it includes Merriam-Webster Reference Library and Information Please Almanac. It also incorporates IBM's ViaVoice Gold speech recognition technology, which lets users dictate into note cards or operate the program via microphone. Reference Suite, unfortunately, is not available yet on DVD.

Webster's International DVD Encyclopedia

A new entrant in the multimedia encyclopedia field, Webster's International DVD Encyclopedia is a collection of many individual books, which are presumably faithful replicas of printed counterparts. This is hard to tell for sure, though, because

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the product says next to nothing about its sources. The core text is *The Cambridge Encyclopedia*, from Cambridge University Press. But one is left to guess about the provenance of, for example, the "main dictionary,"

the "natural history dictionary," or the product's histories of medicine, astronomy, warfare, archaeology, Australia, Ireland, or Great Britain. It should be noted that the disk's developer is Web-

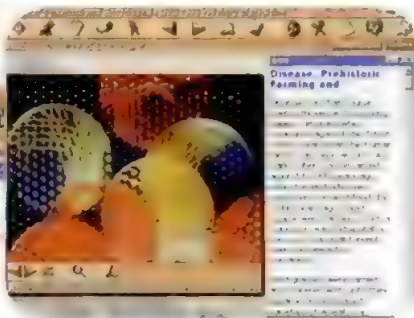
ster Publishing, an Australian firm not related to the venerable dictionary of the same name.

This is an odd collection,

the planetarium feature in Compton's), a couple of games, a lot of information about the United Nations, and many other items that bear no particular relationship to one another.

Though its multimedia adornments are numerous, Webster's is hamstrung by its bookish orientation. A topic search may well plant you on page 867 of some 3,500-page book, leaving you with a window full of text and perhaps a few media items. But you'll struggle for context once you arrive, because there's no outline to navigate with. Clicking a link in the text may take you to an entirely different book, making it still harder to get an overview of your surroundings.

There's lots to wander through and plenty to entertain you here, but as a research tool, Webster's—with its clumsy navigation tools and undocumented sources—leaves much to be desired.



somewhat weighted toward matters British and religious. In addition to the aforementioned books (and there are plenty more than those listed), there are documentary presentations on such subjects as "death-defying divers of Pentecost" and "in the footsteps of Christ." There's also a foreign-phrase guide, providing spoken samples of 20 languages, a Star-Gazer module (somewhat like

ACTION GAMING

Stylized Combat

By T. Liam McDonald

Monolith's *Shogo: Mobile Armor Division* is a strange brew of Japanese anime-style visuals and classic meat-and-potatoes battling robots of the *Battletech* or *MechWarrior* variety. Together these two influences create an action game with a unique feel, which is no mean feat in a genre crowded with *Quake II* knock-offs. Powered by Monolith's Lith graphics engine, *Shogo* is a stylish and entertaining counterpoint to conventional first-person shooters.

"Mech"-style games (in which you battle from within a mechanized robot) are often distinguished by their control complexity and the rather heavy, lumbering feel of the robots themselves. *Shogo* comes at this genre from the other side: Its Mobile Combat Armor (MCA) units are fast

and agile. They can move like a person, with the difference being their towering height and heavy firepower. This creates a faster and more aggressive kind of game.

MCAs come in a variety of types and can be equipped with a wide array of guns, rocket launchers, lasers, and other deadly gear. Weapons aren't limited to robots alone. Many missions require that you leave your MCA and complete part of the action on foot with hand-held guns. This interesting mix of mission styles drives *Shogo* through its narrative campaign, which casts you in the role of Sanjuro, an MCA officer fighting a resistance called the Fallen. The fight is for control of a substance called *kato*, which is essential to space flight and the expansion of the confederation. A rich cast of foes, heroes, and lovers weaves

through this almost RPG-like action adventure.

Visually, *Shogo* is a real surprise. The anime style of the robot designs and the different human characters gives the

on midrange computers are acceptable, though you should not really try *Shogo* with any-

SHOGO: MOBILE ARMOR DIVISION
★★★★★ \$49.99 list.
Monolith Productions Inc.,
800-241-4263,
www.lith.com.



game a sleek, cinematic feel. Though the palette is a bit drab and gray, the lighting and explosion effects are colorful enough to make up for this. Frame rates

thing less than a Pentium/200 with 32MB of RAM and a 3-D accelerator card.

There are two minor problems with *Shogo* that Monolith has recognized and vows to fix. Internet play is slow and unstable, and AI is only moderately challenging. Despite these missteps, *Shogo* is still more interesting, entertaining, and unusual than most 3-D action games.

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Quick Clips

Barrage

From your position at the controls of a hovercraft, you must fire at as many objects as you can see—as often as possible. Though the graphics are eye-popping (a 3-D accelerator is required), the controls are unwieldy, and the plot offers nothing new. \$26.95 list; Activision, 310-255-2000.

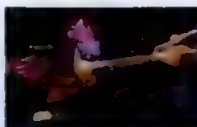


Delta Force

An action game with a military twist, Delta Force drops you into the roll of a Special Forces agent assigned to battle terrorists, drug lords, and other unsavory characters. We liked the variety of weaponry and the intense game play in single and multi-player modes. \$35 street; NovaLogic Inc., 800-858-1322.

Klingon Honor Guard

First-person shooter meets "Star Trek: The Next Generation" in Klingon Honor Guard, the first game to license the Unreal gaming engine. Though it breaks no new ground with its story line or its action, the game offers great graphics, tons of game play, and oodles of "Star Trek" references. \$49.95 list; MicroProse Inc., 510-864-4550.

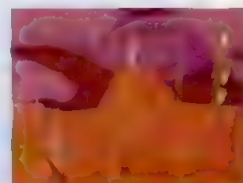


Sabrina the Teenage Witch: Spellbound

Pretcen fans of the television series of the same name will get a kick out of this CD, voiced by star Melissa Joan Hart and others from the show. But game play is too simplistic, and the animation and voices sync up as well as an old Godzilla movie. \$35 street; Knowledge Adventure Inc./Simon & Schuster Interactive, 800-542-4240.

Sentinel Returns

At first, Sentinel Returns, based on the 1980s classic Sentinel, seems way too confusing to enjoy. But once you understand that the goal is to attain height (and in the process, power) by strategically scaling the game's psychodelically colored mountains, Sentinel Returns reveals itself to be an addictive logic-based puzzle. \$49.95 list; Psygnosis, 800-438-7794.



Smart Games Challenge 3

Prepare to spend countless hours huddled over your PC, trying to solve the deliciously difficult puzzles in Smart Games. There are 20 games in five categories: word, strategy, logic, perception, and music. Online contests let you play against other puzzle fanatics. \$29.95 list; Hasbro Interactive, 800-400-1352.

Coming Up

What's in the Next Issue of *PC Magazine*

Windows CE H/PC Pro

The latest Microsoft Windows CE operating system has finally arrived. We'll review the new OS and some of the first devices to use it, as well as some Windows 98-based mini-notebooks, comparing their strengths and weaknesses.

Remote-Access Servers

If your small- to medium-size company or branch office needs to support telecommuters who log onto the corporate network when out of the office, a remote-access server is the solution for you. We will review five of the latest offerings.

Sounds Good!

From PCI and USB audio to immersive 3-D sound algorithms, PC sound technology is changing at a rapid pace. We'll explain the various changes and what they mean to you. We'll also evaluate the competing 3-D sound standards side by side to hear which sounds best.

Desktop Cooking

Cooking and your computer? An odd combination, but the cooking CD-ROMs and Web sites we'll look at will have you looking like a master chef in no time.



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PC Magazine, ISSN 0898-8507, is published twice a month except in July and August at \$49.97 for one year. Ziff Davis Inc., One Park Ave., New York, NY 10016-5802. Periodicals postage paid at New York, NY 10016-5802 and at additional mailing offices. POSTMASTER: Address changes to *PC Magazine*, P.O. Box 54093, Boulder, CO 80328-4093. The Canadian GST registration number is 14049 6720 RT. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement No. 266477. Printed in the U.S.A.



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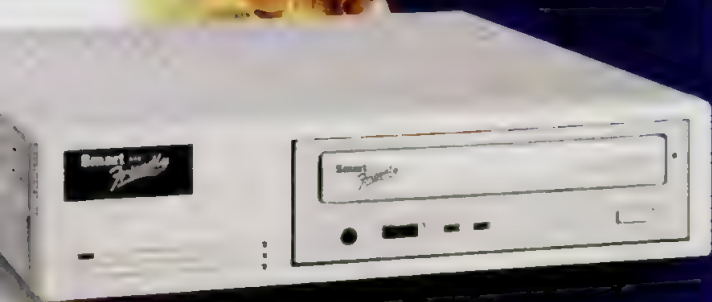
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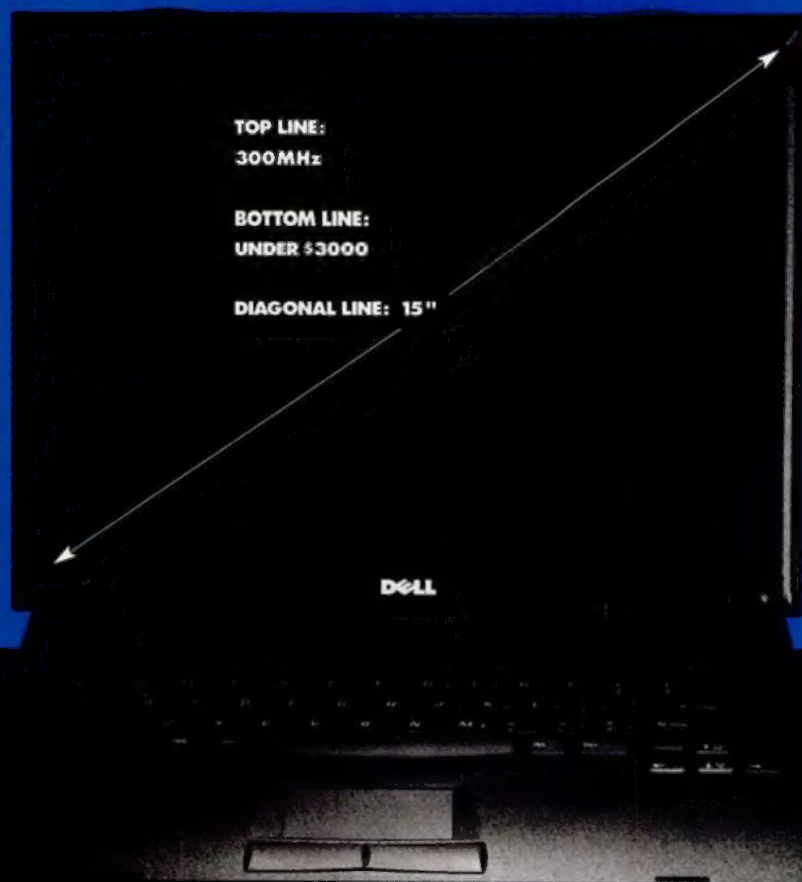
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Hardware Wavetable • Intelligent Lithium Ion Battery • MS Office 97 Small Business Edition v2.0
 warranty^Δ **Common features for Inspiron 3500:** • 3D Surround Sound and Software Wavetable
 • Intelligent Lithium Ion Battery • MS Office 97 Small Business Edition v2.0 • MS Windows 98

INSPIRON D300GT PENTIUM II PROCESSOR AT 300MHz	NEW DELL INSPIRON 3500 D266GT PENTIUM II PROCESSOR AT 266MHz	NEW DELL INSPIRON 3500 D233XT PENTIUM II PROCESSOR AT 233MHz
Performance • 14.1" XGA Active Matrix Display • 32MB SDRAM (256MB Max) • 3.2GB Ultra ATA Hard Drive • NeoMagic MediaMagic 256AV AGP Video • Deluxe Nylon Case ★ Upgrade to a 4GB Ultra ATA Hard Drive, add \$99. ★ Second Intelligent Lithium Ion Battery, add \$129. ★ 56K Capable™ Gold Card Global Modem, add \$139. ★ Inspiron 3500 Port Replicator, add \$139.	Light Weight, Light Price • 13.3" XGA Active Matrix Display • 32MB SDRAM (256MB Max) • 3.2GB Ultra ATA Hard Drive • NeoMagic MediaMagic 256AV AGP Video ★ Upgrade to 64MB SDRAM, add \$99. ★ Deluxe Nylon Case, add \$49. ★ 56K Capable™ x2 Modem, add \$119. ★ Upgrade to 3-Year Next-Business-Day On-site^Δ Service, add \$149. ★ Second Intelligent Lithium Ion Battery, add \$129. ★ 3Com 10/100 Fast Ethernet Adapter, add \$129.	Light Weight, Light Price • 13.3" XGA Active Matrix Display • 32MB SDRAM (256MB Max) • 3.2GB Ultra ATA Hard Drive • NeoMagic MediaMagic 256AV AGP Video ★ Upgrade to 64MB SDRAM, add \$99. ★ Deluxe Nylon Case, add \$49. ★ 56K Capable™ x2 Modem, add \$119. ★ Upgrade to 3-Year Next-Business-Day On-site^Δ Service, add \$149. ★ Second Intelligent Lithium Ion Battery, add \$129. ★ 3Com 10/100 Fast Ethernet Adapter, add \$129.
\$2299	\$1999	\$1999
Business Lease ^Δ : \$87/Mo., 36 Mos. Order Code #891205	Business Lease ^Δ : \$76/Mo., 36 Mos. Order Code #891207	Business Lease ^Δ : \$76/Mo., 36 Mos. Order Code #891207

DELL POWEREDGE® SERVERS

Common features: • 512KB Integrated L2 ECC Cache • Integrated Ultra-2/LVD and Ultra/Narrow SCSI Controllers • 32X Max™ Variable SCSI CD-ROM Drive • HP® OpenView™ NNM Special Edition • 3 External 5.25" Drive Bays plus Dedicated 3.5" Floppy Drive Bay • 6 Expansion Slots: 4 PCI, 2 PCI/ISA

DELL POWEREDGE 2300 SERVER PENTIUM II PROCESSOR AT 450MHz	DELL POWEREDGE 2300 SERVER PENTIUM II PROCESSOR AT 350MHz
(RAID 5 CONFIGURATION) • 128MB 100MHz ECC SDRAM • Three 9GB Ultra-2/LVD SCSI Hot-Swap Hard Drives • Ultra-2/LVD PowerEdge Expandable RAID Controller 2/SC • Intel Pro/100B PCI Ethernet Adapter • 6-1" Hard Drive Bays • 3-Year Next-Business-Day On-site^Δ Service • 7x24 Dedicated Server Hardware Technical Telephone Support ★ Upgrade to 256MB 100MHz ECC SDRAM, add \$389. ★ APC Smart-UPS 700W Power Supply, add \$369.	(DUAL PROCESSOR/RAID CAPABLE) • 64MB 100MHz ECC SDRAM • 4GB Ultra-2/LVD SCSI Hard Drive (Hot-Swap Optional) • Intel Pro/100B PCI Ethernet Adapter • 4-1.6" or 6-1" Hard Drive Bays • 3-Year Next-Business-Day On-site^Δ Service • 7x24 Dedicated Server Hardware Technical Telephone Support ★ Upgrade to 128MB 100MHz ECC SDRAM, add \$189. ★ Microsoft Windows NT Server 4.0 (10 Client Access Licenses), add \$799. ★ 12/24GB Variable SCSI DAT Tape Backup Unit, add \$749.
\$5499	\$2449
Business Lease ^Δ : \$202/Mo., 36 Mos. Order Code #251202	Business Lease ^Δ : \$93/Mo., 36 Mos. Order Code #251204

^ΔPersonal leasing arranged by Dell Financial Services L.P., an independent entity, to qualified customers. Amount of monthly lease payments above based on 36-month lease. All above monthly lease payments exclude taxes which may vary (for example, Hartford City, IN sales tax \$2.50/month). Shipping cost due with first payment. No security deposit required; subject to credit approval and availability. Lease terms subject to change without notice.

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- Publisher 98
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- Expedia Streets 98

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- Works 4.5a
- Graphics Studio Greetings
- Expedia Streets 98

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INTEL CELERON PROCESSOR AT 333MHz

- 64MB SDRAM
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- ATI 8MB 3D AGP Graphics
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- Yamaha XG 64V Wavetable Sound
- harman/kardon HK-195 Speakers
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- Dell QuietKey Keyboard
- Logitech First Mouse+ Wheel (PS/2v)
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- ATI 8MB 3D AGP Graphics
- 4.8X DVD-ROM Drive
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- harman/kardon HK-195 Speakers
- MS Works Suite 99 with Money 99 Basic
- Dell QuietKey Keyboard
- Logitech First Mouse+ Wheel (PS/2v)
- Upgrade to a 17" (16.0" viewable, 26dp) Triton 1000HS Monitor, add \$99.
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Personal Lease*: \$64/Mo., 36 Mos.
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- 17" (15.9" viewable) 1000LS Monitor
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- 4.8X DVD-ROM Drive
- Turtle Beach Montego A3D 64V Sound Card
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- MS IntelliMouse
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\$1999

Personal Lease*: \$75/Mo., 36 Mos.
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- 3Com USRobotics V.90® Modem, add \$99.
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- Intuit QuickBooks v6.0, add \$118.
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- Crystal 3D 64V Wavetable Sound
- harman/kardon HK-195 Speakers
- Iomega Zip 100MB Internal Drive with One Cartridge
- MS® Office 97 Small Business Edition v2.0 plus Bookshelf Basics 98; McAfee VirusScan
- MS Windows® 98
- Dell QuietKey® Keyboard
- MS IntelliMouse®
- 3-Year Limited Warranty†
- 1-Year On-site[^] Service
- ★ *NEW* 3Com® USRobotics V.90™ PCI Telephony WinModem, add \$49.

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